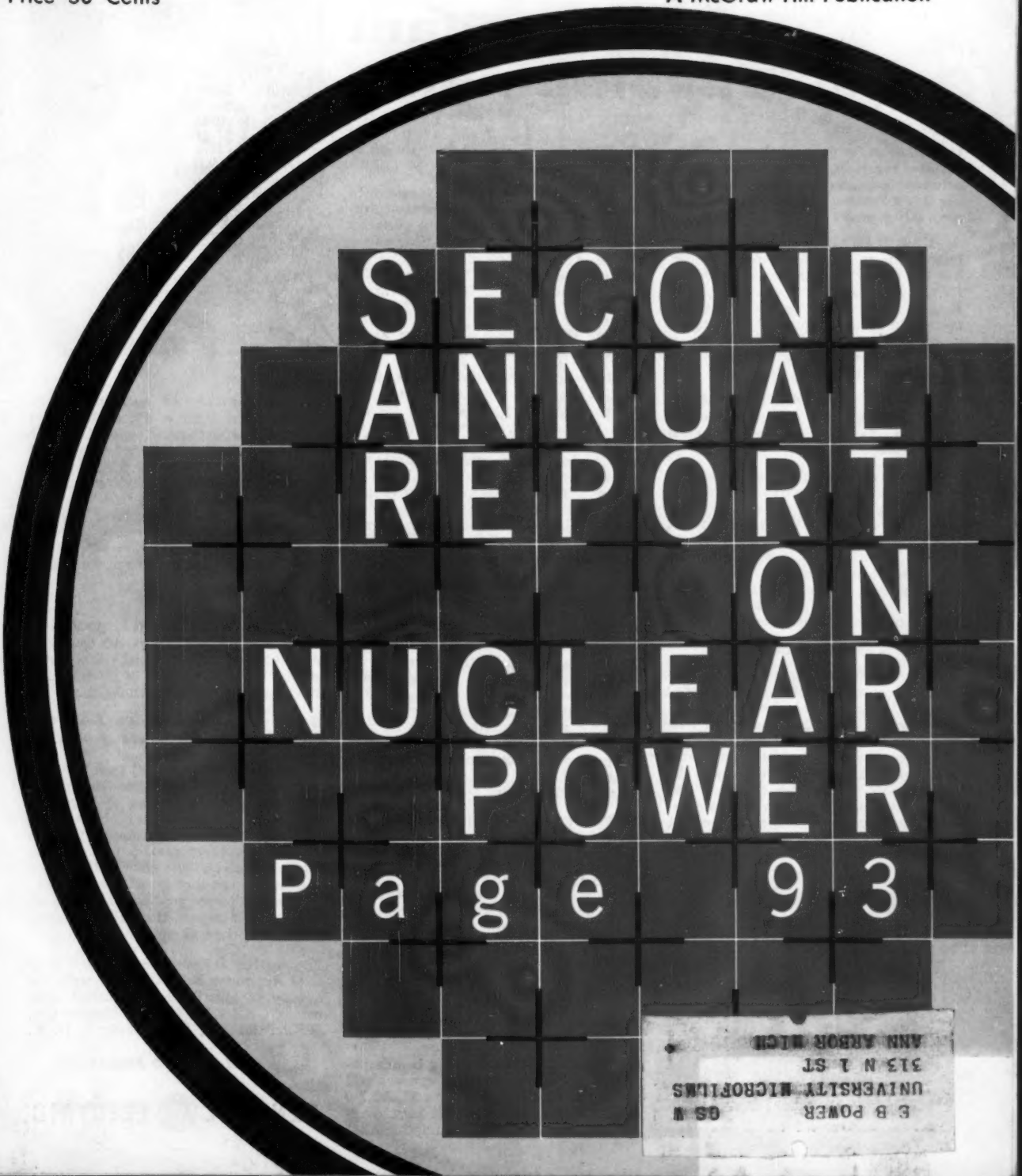
The Electrical Industry's Weekly Magazine

May 20, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication



E B POWER
UNIVERSITY MICROFILMS
313 N 1 ST
ANN ARBOR MICH

Interview with General Electric's

GLENN B. WARREN

Vice President and Consulting Engineer—Turbine Division

Steam And Gas Turbine Power Plant Developments

Q Estimates for the growth of the utility industry represent quite a challenge for a turbine manufacturer. What measures are G.E.'s Turbine Departments taking to meet this growth?

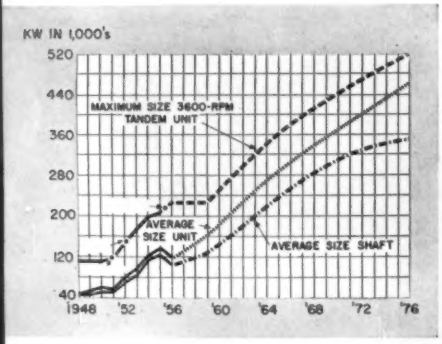
A Growth in capacities is a challenge imposed on us by the general economy, but the utility industry complicates this for us by a more difficult challenge—this is the great need for economy of initial costs, and operating costs of their equipment. And we are judged on the degree to which these needs for economy have been and will be met.

Q Can you summarize some of the recent developments or some potential developments which will help you meet this challenge?

A We are applying the best engineering and development research methods in many technical areas. But there are about seven major paths of progress in our activity where I can cite current developments. These are increased unit size, increased steam pressures, the use of double reheat, longer last-stage buckets, turbine drives for boiler feed pumps, the gas turbine, and atomic power.

Q What is optimum size?

A There is no one answer to that question. We can suggest that on an isolated system, the size of the largest unit should probably and most economically be 7 to 10% of the total system capacity, but interconnections make possible much larger units. Looking to the future, the chart below shows the average- and maximum-size large steam turbine-generator units we have shipped in the past 10 years. Curves are extrapolated to 1976.



Q What do you predict in the area of steam pressures?

A I think that there is much reason to believe that the increase in steam pressure (which has doubled about every 12 years) will continue for some time. However, I strongly suspect that after 5,000 to 6,000 psig is reached we may be reaching the point of diminishing returns on even larger units.

Q Are there further economies to be gained in higher temperatures?

A Initial and reheat temperatures have steadily increased. Initial temperature has increased almost 12 F per year for the past 50 years. Here again, I think we would make a mistake to feel that this continued increase in temperature in the steam cycle will continue unabated at this rate. There is much evidence that as we exceed 1050 F, superheater, piping, and turbine costs are increasing faster than the corresponding gain in reduced fuel consumption on resuperheated plants.

Q How about potential gains in the low-temperature end of the cycle?

A By using longer last-stage buckets, double flow in place of single flow, triple flow in place of double flow, etc., by installing supplementary cooling towers which should reduce the disadvantage of hot summertime cooling water both on economy and capacity, it may be perfectly feasible to obtain 1, 2, or 3 or more percent greater plant capability at the critical peak load period and increased year around economy.

Q You mentioned turbine drives for boiler feed pumps.

A Yes, we think they should contribute to the efficiency of station operations. For example, they can help increase reliability of the main shaft by reducing the amount of load it has to carry. For larger higher-pressure units, we believe variable-speed turbine drives for these high-speed, high-pressure, boiler feed pumps will be efficient and reliable.

Q What role will gas turbines play in the electric utility industry?

A We have on our drawing boards potential machines which it appears will reach capabilities of 30,000 to 35,000 kw or probably higher, and will have overall economies of fuel consumption that will surpass that of comparable size steam plants. Some of these plants are arranged for automatic operation. We expect real progress in the not-too-distant future with coal-burning gas turbines, and in the area of combined steam and gas power plants. We believe this new power tool will have important applications both as peakload, end of line, or base load plant application when used alone or in conjunction with steam plants.

Q What about the atom?

A It appears highly probable that within the next 10 to 20 years, the energy of the atom will be used widely as a source of heat for either steam or gas turbines, and we are preparing for that day.

Q Do you think the trend to lower fuel consumption per kw-hr will continue?

A Much of the potential gain in economy in the steam cycle has been made, and this—at the beginning of a tremendous capacity expansion on the part of the utility industry—is fortunate. On the other hand, there remain many areas, some of which we have just touched upon, in which we can together attain still more economy in power production so that we will continue to help the utility industry in lowering the cost per kw-hr.

For further information, contact your local Apparatus Sales Office, or write for a copy of Mr. Warren's detailed comments, GER-1364. General Electric Co., Section 301-358, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 20 MAY 20, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

Purchasing Agents Like Competition
Most like to see stiff battles for their dollars, but smaller companies see virtue in limiting competition.....p 78

Meet Neil Simpson, Black Hills P&L
His meteoric course to the presidency had its humble beginning in 1937 when he was a "part-time flunky".....p 84

MANAGEMENT

Staff Authority Aids Safety
Accident frequency rate has been cut in half at Commonwealth Edison since IR department has taken over.....p 88

DISTRIBUTION

Service-Drop Standards Simplify Selection
Louisiana Power & Light uses tables to minimize changes and provide capacity for 2½ times initial load.....p 90

Makes UG Distribution Easier
Butyrate plastic pipe cuts cost of installing underground conduit for low-voltage circuits in New Orleans.....p 92

Special Report

Second Annual Report on Nuclear Power
Three articles on major aspects in this field are supplemented by a nuclear power plant check list.....p. 93

Departments

Atomic Progress 83
Books 150
Catalogs and Bulletins.....142
Editorials 77
• Electrical Newsletter 19
Engineering Reference Sheet....118
From the Publisher..... 5
How To 113
• Management Newsletter 159
Manufacturers and Markets.....153
Meetings Calendar 176
Meeting Reports 86
New Equipment 128
News About People.....168
News-Beat 85
Sales Assignments 174
Selling 120
Technical Literature 146
Washington Wire 80

INDEX TO ADVERTISERS.....179

ALUMINUM-SHEATHED CABLES

...light ...strong ...smaller diameter ...easy to install and terminate

A seamless aluminum sheath over Okonite cables provides a durable, conduit-type covering of high tensile strength. Yet this aluminum sheath is easily worked with standard conduit tools. It can be bent around obstructions . . . terminated at boxes, transformers, and the like . . . trained in trays . . . or supported by conventional brackets and cable clamps. Standard fittings are available. This low-cost alternate to rigid conduit is available with virtually any Okonite insulation such as rubber, plastic or varnished cambric.

Here are some important benefits of Okonite's aluminum-sheathed cables:

Reduced diameter and lighter weight.

Impervious barrier to liquids and vapors.

Excellent flame resistance.

Costs less than regular conduit installations.

Great mechanical strength, yet easily worked.

For complete data on Okotherm-insulated (silicone rubber compound) aluminum-sheathed cable for use in high ambients up to 200C (392F), contact your Okonite representative or write for Bulletin EW 1088A, The Okonite Company, Passaic, N. J. 4742

where there's electrical power . . . there's **OKONITE CABLE**

Electrical World Staff

Fischer Black Publisher and Editor

Daniel T Braymer Assistant to the Editor

Engineering

Leonard M Olmsted Managing Technical Editor
John J Kearney Assistant Managing Technical Editor
Howard S Knowlton New England Editor
Edward Allen Midwestern Editor
Francis J Kovalcik Middle Eastern Editor
David Rea Southeastern Editor
James G Plunkett Northeastern Editor
Charles F Hochgesang Western Editor
Archer E Knowlton Consulting Editor

News

Herbert R Frankel Managing News Editor
Jesse A Mock Assistant Managing News Editor
Rue M Shoop Associate Editor
Allen Long News Editor **Theodore W Fuller** and **Denise Hennessy** Editorial Assistants
Thomas R Jordan Commercial Editor
Kenneth N McLean Industrial Editor
George B Bryant, Jr Manager, Washington Bureau
V Craig Richter Washington Correspondent

Special Services

Arthur J Stegeman Manager, Market Research
Dexter M Keezer Director, Economics Department
Dora Merris Economist

Production

Kenneth K Kost Manager of Production
George Swift Assistant Manager of Production
Frank C Stockman Art Director
H Tomlinson Howland, Jr Production Editor
Elaine Maguire Assistant Production Editor

Advertising

Warren W Shaw Sales Manager
District Managers: N V Palmer and E S Chapin, New York; E S Chapin, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; M I O'Connell, Detroit; W H Meneilley and J T Schaefer, Chicago; J T Schaefer, St. Louis; E E Shirmer, Los Angeles; R C Alcorn and T H Carmody, San Francisco; Robert H Powell, Atlanta; Gordon Jones, Dallas.
Otto A Drechsel Business Manager
Donald K Ellis Promotion Manager

•

E Bryson Sessions Circulation Manager

. . . *from the publisher*

In this age of specialization, there has been a tendency, rightly or wrongly, to type people by the kind of business or industry they are in. There's the so-called "Salesman" type, "Outdoor" type, "Ivory-Tower" type, and so on.

Is there a "Utility" type? Probably not. This kind of business requires a wide diversification of types and talents.

But there does seem to be a personality trait that dominates, and you could sum it up in the word, "loyalty." At least this is what turned up in a survey we made recently of some of our utility subscribers. Besides looking into their reading habits and their reaction to Electrical World, we tried to find out something about them—their job background, etc. Items:

- Majority of those interviewed had spent all their working career with the same utility.
- More than two-thirds of them had worked for the same utility for over 20 years. Fewer than 10% had been there less than five years.
- Half of them have had their present titles for five years or more.

Happily, we found their loyalty isn't limited to just their employer. They tend to stay with the things they read, too. All of them said they consider themselves to be regular readers of Electrical World. What's more, 80% indicated they read every issue of the magazine.

Fischer Black

ELECTRICAL WORLD

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation, and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for directions regarding subscriptions or change of address.

Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. **Position and company connection must be indicated on subscription orders.** Send to address shown in box at right.

United States and Canada subscription rate for individuals in the field of the publication $6.00 per year, single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

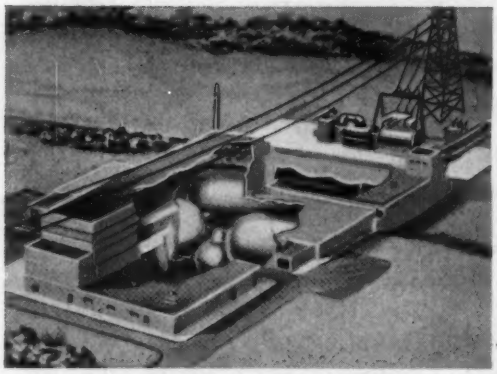
Second-class mail privileges authorized at Albany, N. Y. Printed in U.S.A.

Title registered in U.S. Patent Office. ©Copyright 1957 McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

SUBSCRIPTIONS AND ADDRESS CHANGES: Send subscription correspondence and change of address to Subscription Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W 42nd St., New York 36, N. Y.

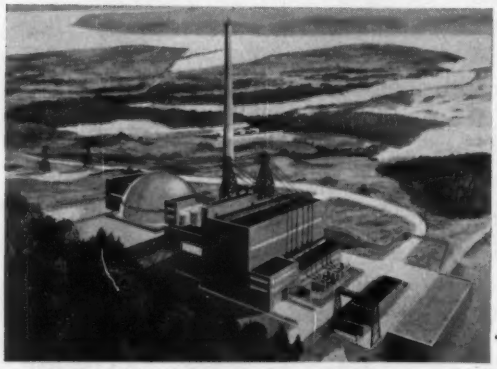
Three of America's LARGEST ATOMIC POWER PLANTS will use MAJOR COMPONENTS* by FW



60,000 KW SHIPPINGPORT PLANT
of the AEC and Duquesne Light Company

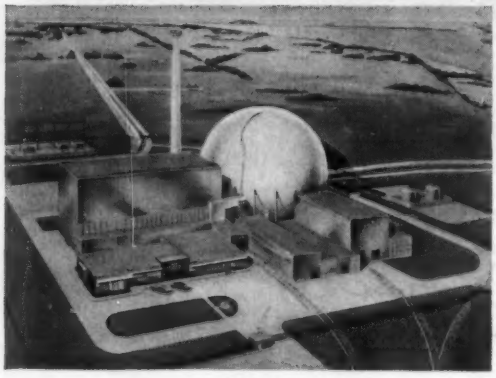
***Steam Generators.** Two of the four steam generators for America's first full scale commercial atomic power plant have been designed and fabricated by Foster Wheeler. They will convert heat from the pressurized water reactor into steam for operating the turbo generator.

***Pressurizer.** Also supplied by Foster Wheeler is the 18-ft high, 300 cu ft pressurizer used to maintain coolant loop pressure. It is designed for 2500 psig at 675 F and contains 342 electric immersion heaters for controlling operating pressure.



275,000 KW INDIAN POINT PLANT
of the Consolidated Edison Company

***Separately-Fired Superheaters.** Saturated steam from the pressurized water reactor will be superheated from 447F to 1000F by two Foster Wheeler oil-fired superheaters, each with a capacity of 1,075,000 lb/hr at 410 psia. Compared to operation with saturated steam direct from the reactor, addition of the superheat cycle will raise plant capacity from 163,000 kw to 275,000 kw and reduce estimated plant cost from $350 to $255 per kw.



180,000 KW DRESDEN STATION
of the Commonwealth Edison Company

***Primary Steam Separator.** Primary steam generated in the reactor will be separated from the water in a Foster Wheeler steam drum designed for a pressure of 1250 psia and capable of delivering 1,400,000 lb/hr at 1000 psia with a moisture content of not over 0.1%.

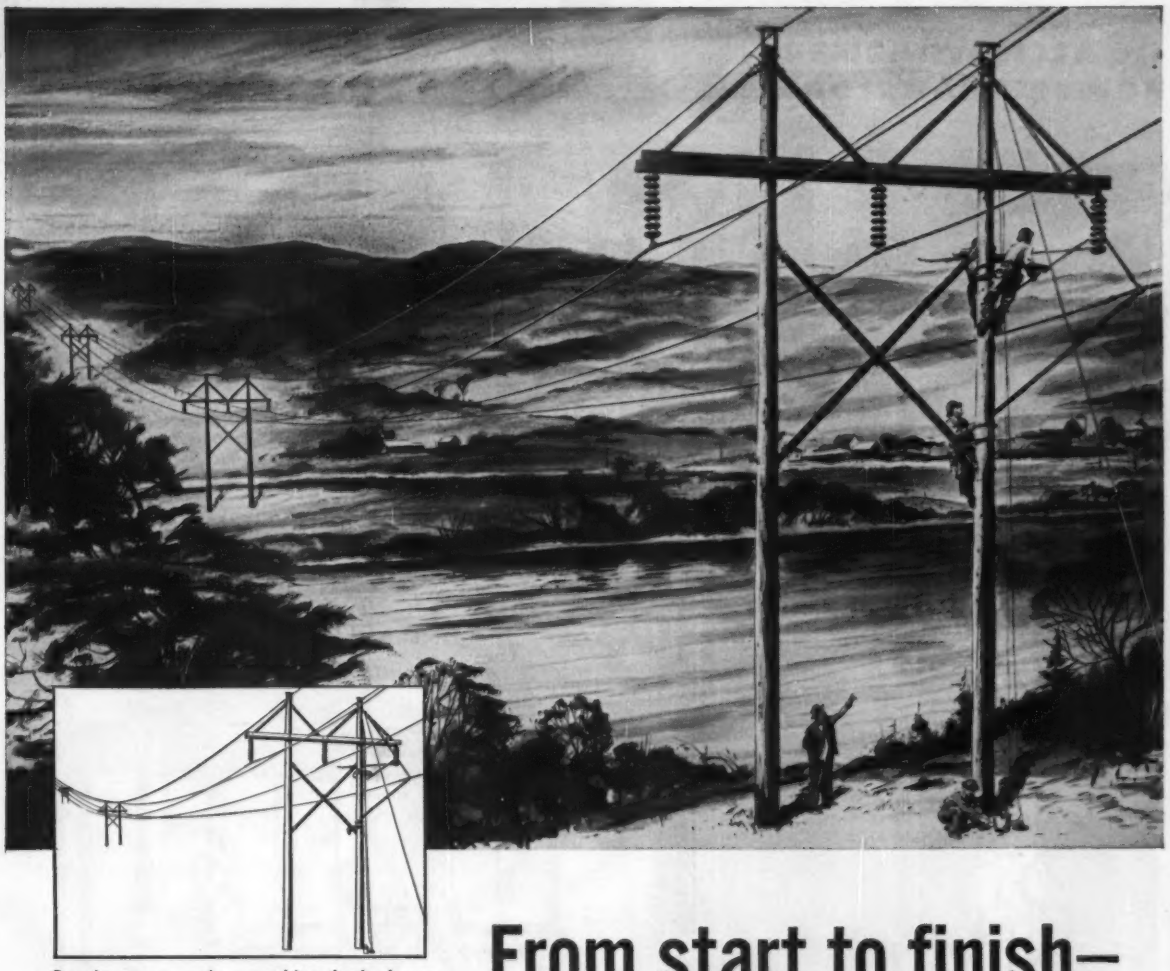
***Secondary Steam Generators.** Primary nuclear heated water will be converted to secondary steam for a reduced-pressure turbine stage by four Foster Wheeler steam generators with a combined capacity of approximately 1,190,000 lb/hr at 510 psia saturated.

IN addition to the above major nuclear components, Foster Wheeler know-how encompasses the design and fabrication of complete nuclear power plants of the aqueous homogeneous reactor type as well as specialized tank-type research reactors.

For further details on any of these items, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.



Graybar can supply everything that's shown above — except linemen and scenery — for line construction *and* maintenance. Poles, crossarms, hardware, tools—a partial list of items that are stocked at strategic Graybar locations throughout the country. All available for fast delivery to you. It pays to call Graybar . . . *first.*

From start to finish— arrange for continuing supplies and equipment—with Graybar

Engineers deep in the problems of new transmission *line construction* must be able to depend upon reliable, on-time deliveries to keep their schedules. And later, to meet the continuing task of *line maintenance*, the selection, dependable delivery and warehousing of supplies and equipment are vital.

Graybar backs up design and construction engineers to speed up these processes. Through more than 130 offices and warehouses, Graybar supplies prompt catalog information on everything electrical needed in line construction and maintenance.

To speed up the selection and delivery of anything and everything you need for line construction and maintenance call Graybar first. *Graybar Electric Company, 420 Lexington Avenue, New York 17, N. Y.*

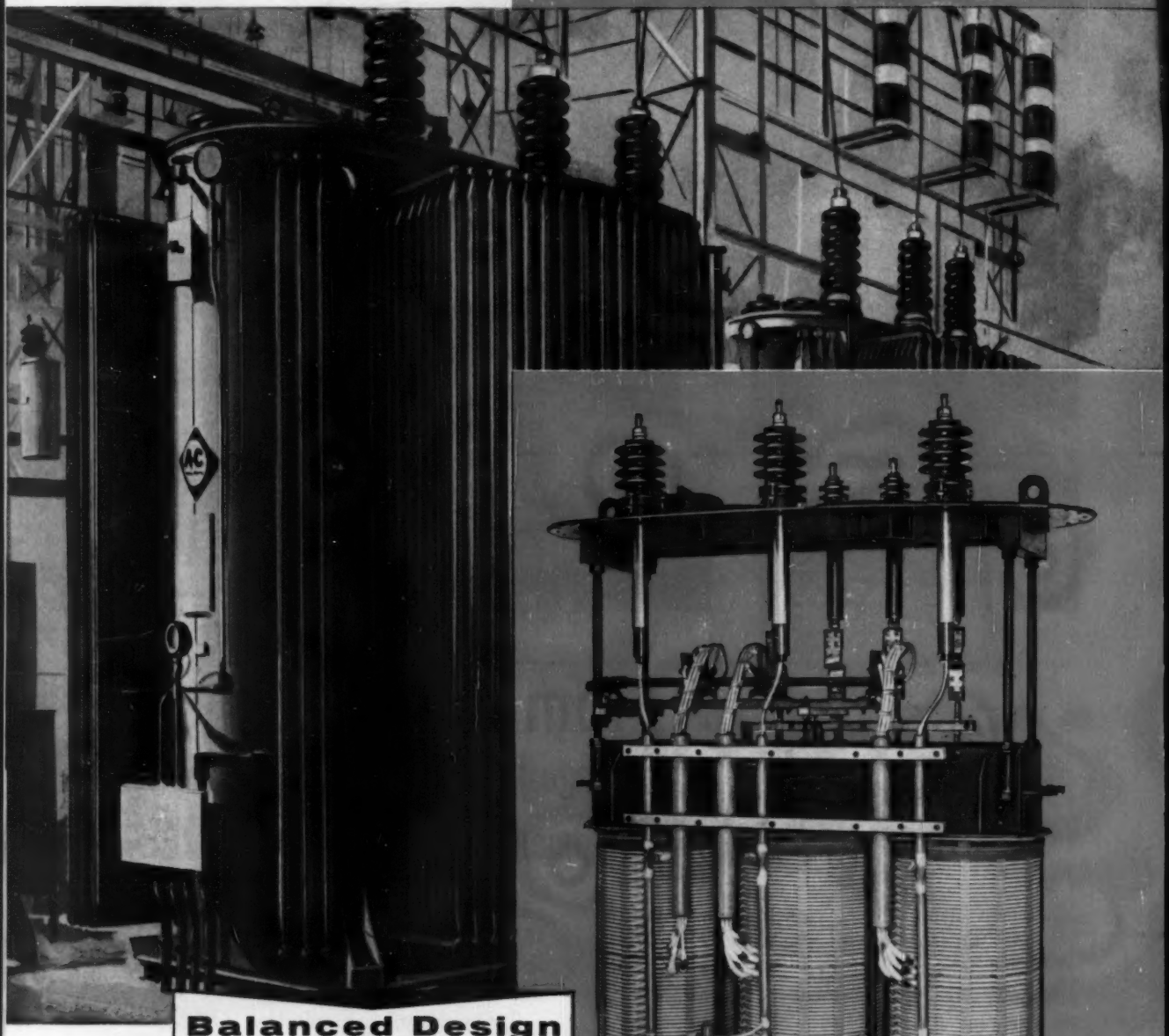
713-95

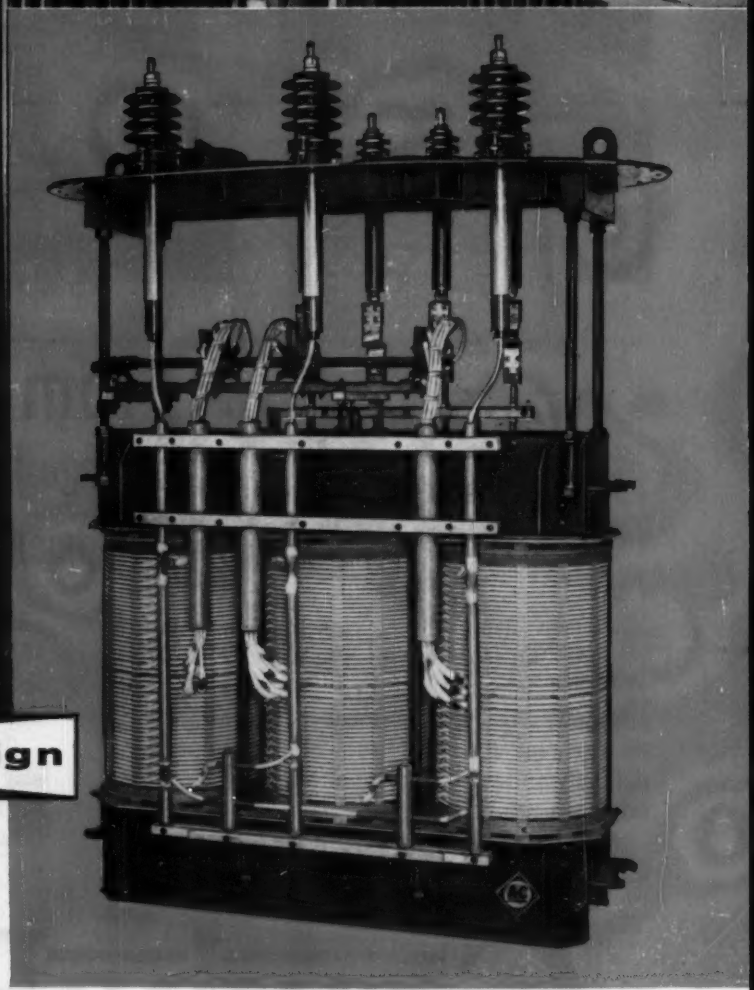
CALL GraybaR FIRST FOR

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

ALLIS-CHALMERS
POWER TRANSFORMERS

Engineered





Balanced Design

...means MORE for your Transformer Dollar

With electrical equipment replacement costs increasing, it's more important than ever to insist upon maximum transformer value. In Balanced Design, features such as corona-free insulation, low gradients, and uniform cooling complement each other to provide outstanding dependability and long transformer life. Get all the facts. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-

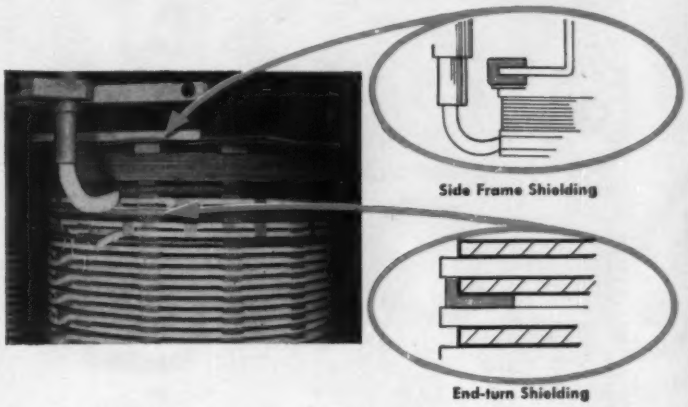
to stay young

Here's Why

1

Corona-Free Design
gives insulation long life

Creeping paralysis caused by corona can't take the life of this transformer. Advanced insulation practices, dimensional properties, proper coordination between solid and liquid insulation materials prevent concentration of dielectric fields and keep corona from forming.

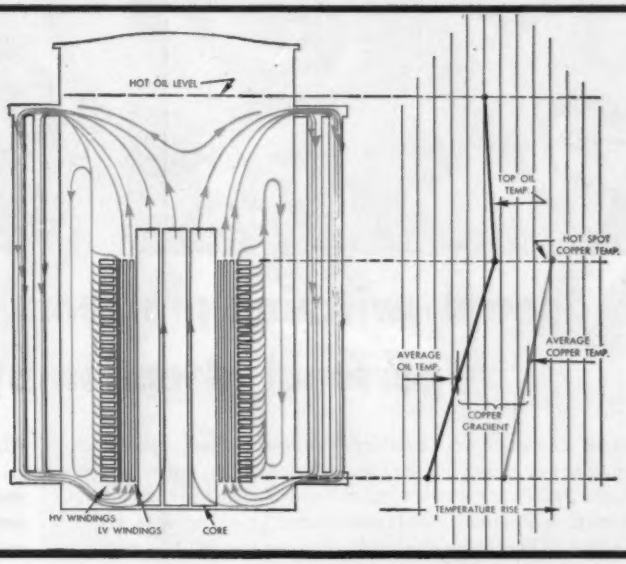


Shown are just two of many shielded areas that protect windings from the overstresses of lightning and switching surges.

2

Low Gradients
thorough cooling lengthens service

Temperature gradients are lower—hot spots are minimized in Allis-Chalmers transformers. Assembly is built for rapid cooling. Coils permit cooling oil to flow through and around all layers. Special core spacers on larger units allow oil to flow through core structure. Insulation coordination and uniform cooling increase insulation life and multiply the value received for each transformer dollar spent.



3

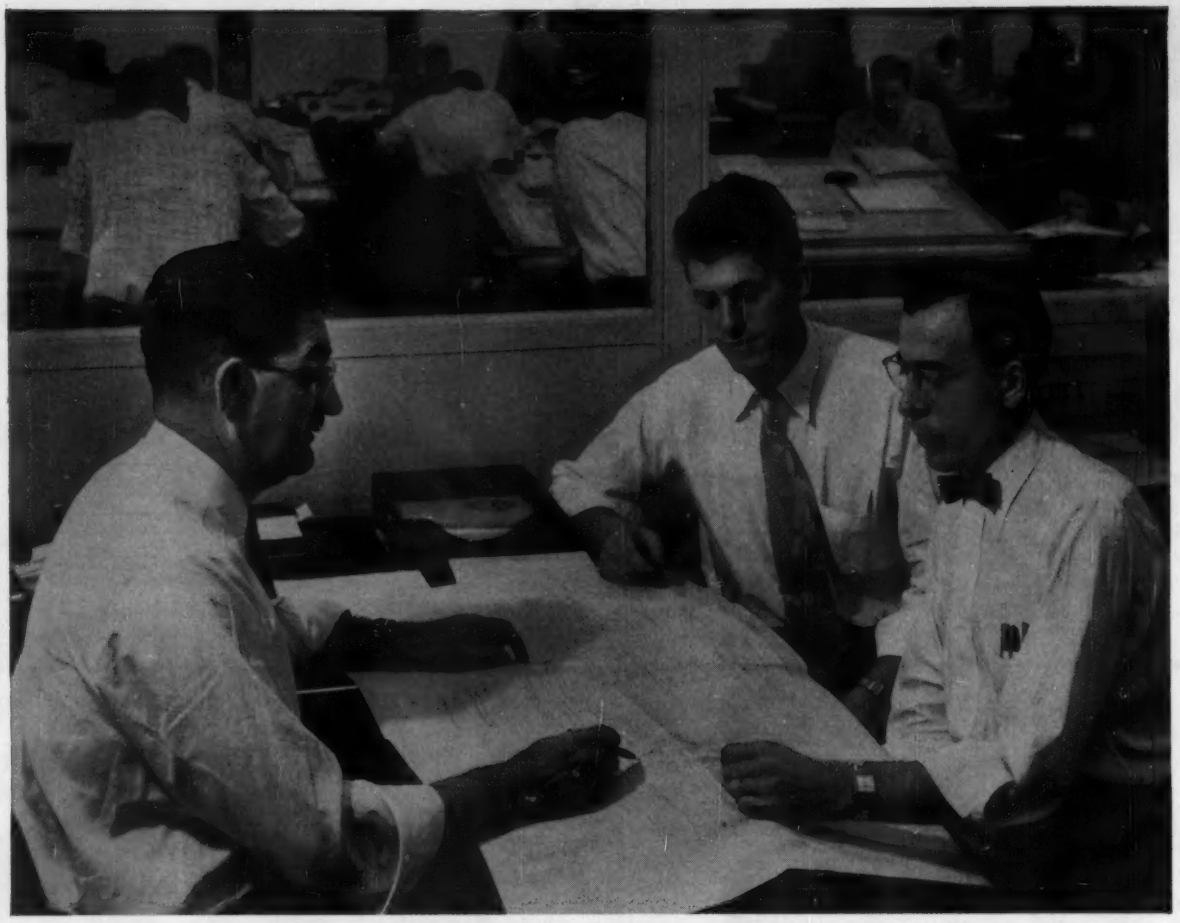
New Radiator Design
cuts maintenance

Fewer parts—simplified shape facilitates inspection . . . there are no nooks and corners where dirt and corrosion get in their destructive licks. Painting costs are reduced. More uniform cooling (with less floor space requirements) extends transformer life.

CHALMERS

A-C ALLIS-CHALMERS

A-5398



Special switching problems need personal attention by specialized engineers

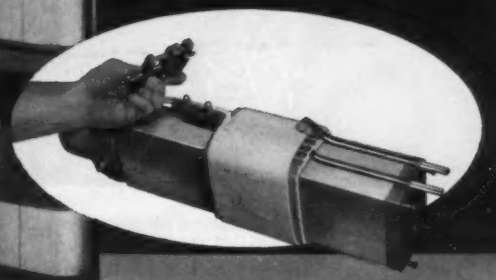
At 3E your inquiry or order receives *personalized, specialized* engineering attention. The typical scene above points up this fact as plans for a switching center get immediate attention from C. A. Koerner, Vice President and Chief Engineer. Engineers Ray Rueffer and Gene Phillips are specialists in switching center design. Their combined know-how coupled with the 3E Company's 45 years of experience in handling switching problems is focused on this customer's particular requirements.

When planning for unusual conditions ... limited space ... plants with dusty or corrosive atmosphere ... or where you need economy today plus allowance for tomorrow's expansion ... *see 3E.* Our staff of qualified engineers is experienced in handling the unusual ... with a fine record in designing for economy without loss of efficiency or safety. Their facility with standard 3E components designed for maximum flexibility is an asset that is beneficial to our customers.

3E Auto Speed load interrupters together with 3E know-how made this 5 bay switching center safe, sure and economical.

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois
Representatives in principal cities — in Canada by Powerlite Devices, Ltd.

She goes to a felt-padded cupboard to fetch your POLE STAR coil a mold



Accurate dimensions — particularly in the core-and-coil assembly — contribute much to the dependability and efficiency of Pole Star distribution transformers. For that reason, coils are wound on precise, aluminum molds, which are given "kid-glove" treatment when not in use. High and low voltage molds are moved directly from felt-padded storage bins to the winding machine and vice versa, with no in-between reposal on tables or floor. Frequent inspection of all molds makes certain that the original precision is maintained.

With aluminum molds, end turns are tied in with spring clips; there is no marring of the mold surface such as when nails are used for this purpose with ordinary wooden molds. A further advantage is that aluminum is not subject to "aging," whereas wooden molds often dry up and crack or shrink, with consequent changes in dimensions.

Such concern with accuracy is typical of Pole Star production methods. It means outstanding quality and dependability . . . every time.

All Pole Star distribution transformer coils are wound on aluminum molds, which assure coil uniformity and also permit the use of special fixtures for accurate placement of leads. During winding, each low voltage lead—which is prebent to the desired radius on a jig—is held firmly in place by the two-piece clamping device shown above.

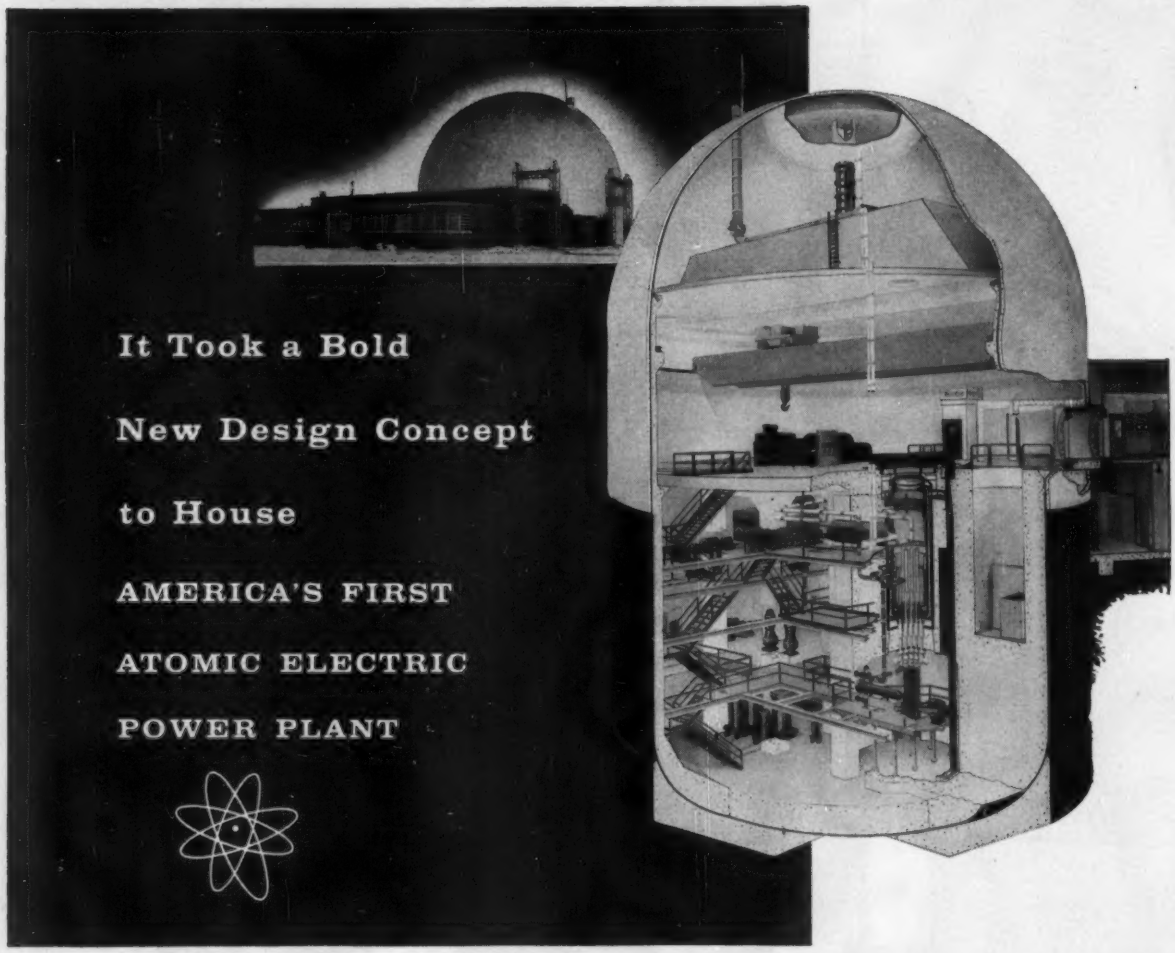
3 through 500 kva, through 67,000 volts

POLE STAR pt *167 Production Controls make Pole Star Best!*

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PENNSYLVANIA



How do you house an atomic electric power plant? Dig a hole five stories down. Erect a giant ten-story welded steel "containment vessel." Seal it off air-tight, and you have one of the largest pressure vessels man has ever been called on to build.

That's the story, over-simplified, of the unique housing required for America's first nuclear-powered electric plant, the Experimental Boiling Water Reactor, at Argonne National Laboratory, Lemont, Illinois.

In our practical, efficient world of engineering, there is a sound structural reason for the unusual dome-shaped building, now recognized by everyone as the symbol of atomic-power-for-peace.

Radioactive steam and gases must be contained within the system. The precautions necessary demanded an air-tight building, 80 feet in diameter by 119 feet high.

This giant welded steel structure, designed to withstand a pressure of 15 pounds per square inch above gage pressure, was made concave throughout, with a semi-ellipsoid bottom and a hemispheric top.

Upon completion, the half-million cubic foot shell was tested for air-tightness. Never before had so large a welded structure required such thorough testing against air loss.

Graver's skills, backed by a century of experience, were called upon to fabricate, erect and test this unique steel structure.

Graver's research department devised the special air-tightness testing procedures. Graver fabricated all sealing devices—the access air-locks, bulkheads and doors, and the two water-demineralizing systems. It also furnished the saucer-shaped 15,000 gallon water tank suspended under the dome.

This application of Graver's skills in the fabrication and erection of America's first atomic power plant is indicative of Graver's readiness to help you fulfill your plans for the future, no matter how unusual or exacting the requirements.

Building for the Future on 100 Years of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • NEW YORK • PHILADELPHIA • EDGE MOOR, DELAWARE
PITTSBURGH • DETROIT • CHICAGO • TULSA • SAND SPRINGS, OKLAHOMA
HOUSTON • LOS ANGELES • FONTANA, CALIFORNIA • SAN FRANCISCO

GRAVER

BUILT-IN RUGGEDNESS

FARGO "5000" *Series* CONNECTORS*

Ask your
Line Material Field Engineer
for complete details.

THE ORIGINAL VISE-TYPE CONNECTOR

- ***Grips like a vise . . . because it is built like a vise.*** The Fargo "5000 Series" Connectors feature the one-piece . . . vise type design that tightens smoothly and stays tight. This original vise-type connector is the basis of the complete line of Fargo Connectors for copper or aluminum. They are fast and easy to apply and all "series" can be installed with "hot" tools.

You get better connections with Fargo Connectors . . . easier . . . faster . . . smoother . . . surer . . .

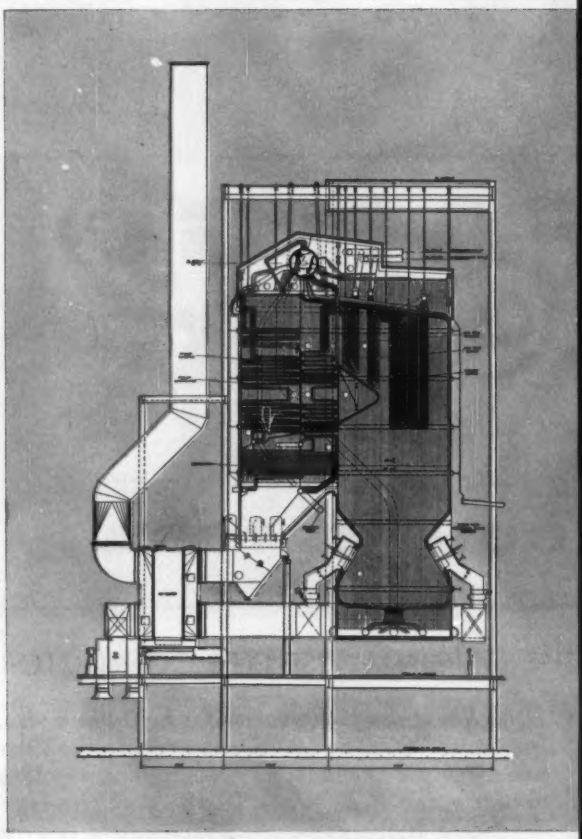
Fargo "vise type" one piece connectors are available for copper to copper, aluminum to aluminum and aluminum to copper connections from 8 sol through 1,000,000 CM.

* Patented

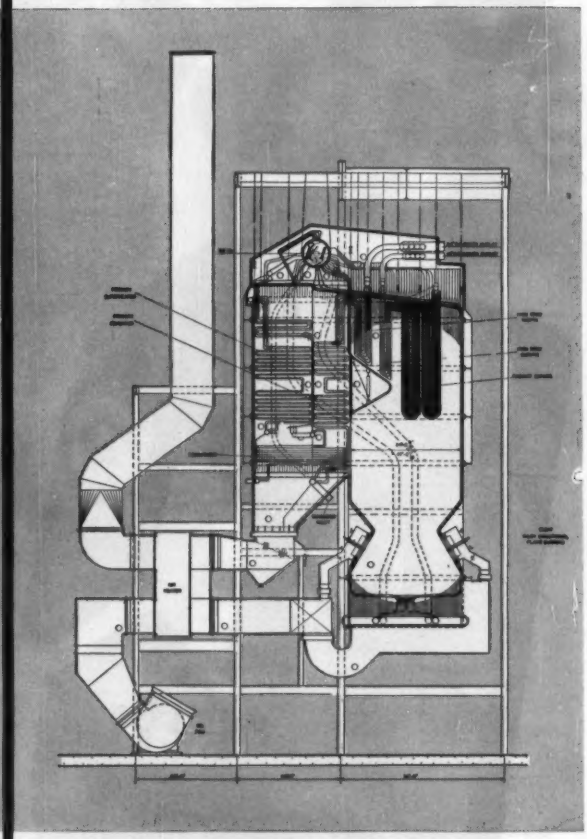
Distributed by
LINE MATERIAL INDUSTRIES
(A McGraw Edison Company)
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

Solve problem of



Riley Reheat TURBO FURNACE Unit:
For Texas Public Utility
Capacity: 825,000 lbs/hr. Pressure: 1750 psig design
Superheat and reheat temperatures: 1005 F
Fuels: Natural Gas, Oil, Future Coal
12 Riley Directional Flame Burners
Pressurized Turbo Furnace



Riley Reheat TURBO FURNACE Unit:
For Texas Public Utility
Capacity: 1,250,000 lbs/hr. Pressure: 2125 psig
Superheat and reheat temperatures: 1005 F
Fuels: Natural Gas, Oil and Future Lignite
16 Riley Directional Flame Burners
Pressurized Turbo Furnace

OTHER RILEY TURBO FURNACE UNITS INSTALLED OR ON ORDER

Northeast Paper Mill
One 175,000# Unit
Pulverized Coal

West Va. Chemicals Co.
One 289,000# Unit
Pulverized Coal, Oil

Eastern Seaboard
Public Utility
Three 500,000# Units
Fluid Coke, Refinery Gas, Oil, Coal

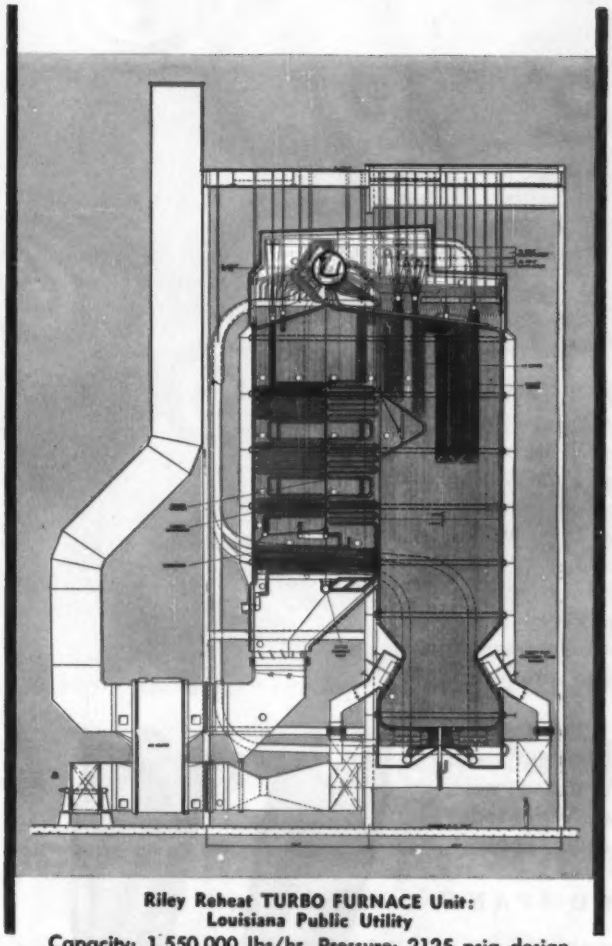
Southern Aluminum Co.
Three 320,000# Units
Gas, Oil, Future Coal

West Va. Chemicals Co.
One 175,000# Unit
Pulverized Coal, Oil

Florida Public Utility
One 600,000# Unit
Reheat — Oil, Future Coal

RILEY DESIGNS, MANUFACTURES AND INSTALLS COMPLETE STEAM GENERATING UNITS AND FUEL BURNING EQUIPMENT FOR PUBLIC UTILITY AND INDUSTRIAL POWER AND HEATING PLANTS

multi-fuel firing



Riley Reheat TURBO FURNACE Unit:
Louisiana Public Utility
Capacity: 1,550,000 lbs/hr. Pressure: 2125 psig design
Superheat and reheat temperatures: 1005 F
Fuels: Natural Gas, Future Oil, Pulverized Coal, Lignite, Delayed Coke, Fluid Coke.
20 Riley Directional Flame Burners
Pressurized Turbo Furnace

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

THESE three RILEY TURBO FURNACE boilers will solve the fuel selection problem for their public utility owners.

When coal, lignite petroleum coke become more economical to use than oil or gas, these TURBO FURNACE boilers will be ready to burn such fuels. No expensive conversion is needed . . . the addition of pulverizers and coal piping can be accomplished with a minimum of outage time. What's more, when burning low grades of oil and coal, furnaces stay clean; no slag blowers are needed.

The extreme turbulence in the combustion chamber produces a high burnout rate and combustible losses are practically nil.

Investigate the unusual operating characteristics of the RILEY TURBO FURNACE: contact your Riley representative or Riley Stoker Corporation, Worcester, Mass. for detailed information about them.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver (Englewood), Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

Tear up

those old cost estimates!

The low prices of the new Copperweld* Type M Guy Strand make your old cost estimates out-of-date! Copperweld has always given you more years of service per dollar of cost. Now, prices on Type M Guy Strand make first cost lower and more attractive.

Basically, the principle of the new Type M Guy Strand is still the same—each wire has a heavy copper sheath inseparably molten-welded to an alloy steel core. Lower prices result from a new higher strength strand developed by Copperweld research, and from new specialized guy strand production techniques.

Type M Guy Strand is available in 2.2M, 4M, 6M, 8M, 10M, 12.5M and 16M strengths. It is pliable—easy to install. And, because of the molten-weld, the copper will not crack, flake or peel. Write today for complete details about this money-saving product.

*Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

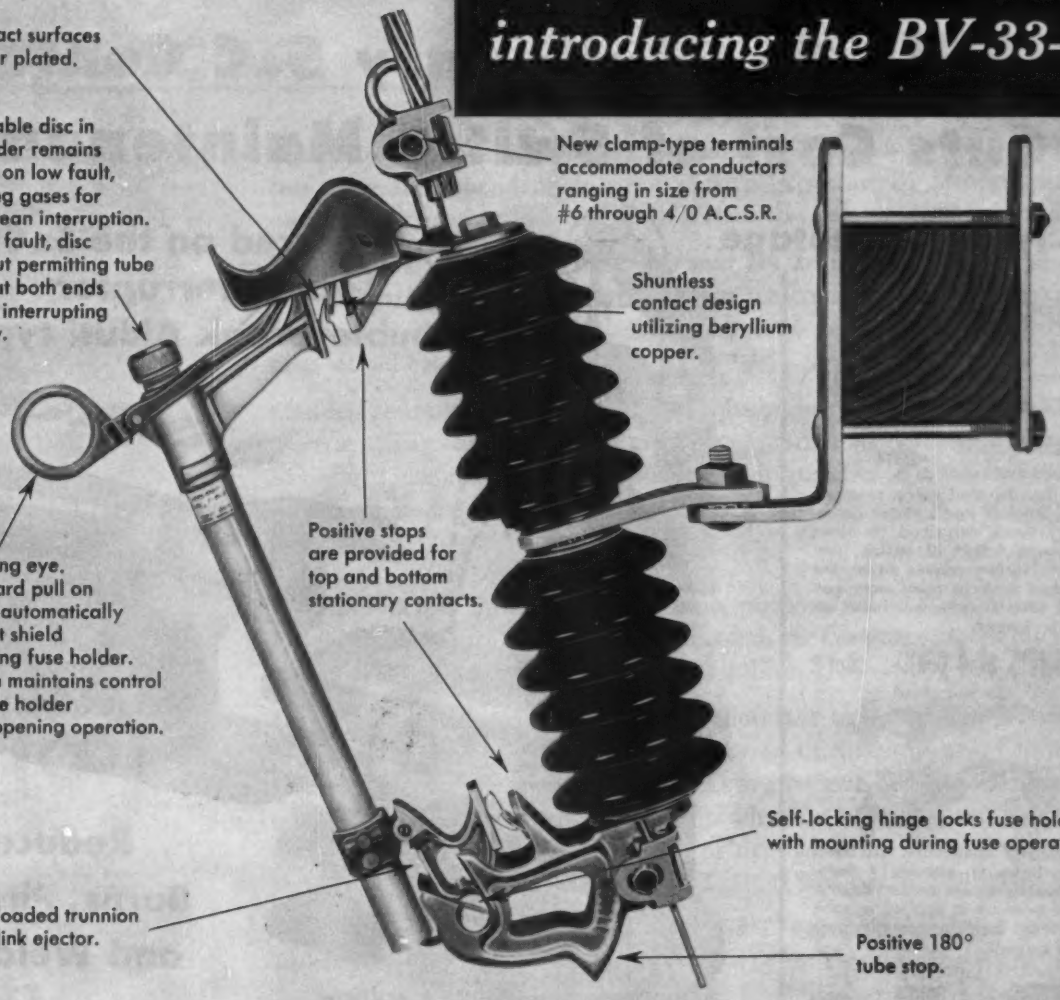
GET THE FACTS ON

New Copperweld TRADE MARK

COPPER MOLTEN-WELDED TO STEEL

TYPE M GUY STRAND

introducing the BV-33-F


All contact surfaces are silver plated.
Expendable disc in fuse holder remains in place on low fault, restricting gases for quick, clean interruption. On high fault, disc blows out permitting tube to vent at both ends for high interrupting capacity.
New clamp-type terminals accommodate conductors ranging in size from #6 through 4/0 A.C.S.R.
Shuntless contact design utilizing beryllium copper.
Positive stops are provided for top and bottom stationary contacts.
Operating eye. Downward pull on this eye automatically lifts sleet shield unlatching fuse holder. Lineman maintains control over fuse holder during opening operation.
Self-locking hinge locks fuse holder with mounting during fuse operation.
Spring-loaded trunnion acts as link ejector.
Positive 180° tube stop.

A Powerful New Southern States Cutout For Handling Restricted or Heavy Faults

CHECK THE FEATURES of the powerful new BV-33-F! Whether you are a lineman, or an engineer responsible for applying cutouts on an entire system, we believe the BV-33-F will meet your requirements.

Despite its exceptionally high interrupting rating the BV-33-F clears restricted faults quickly and cleanly. Secret of its success on faults of any magnitude lies in the expendable disc in the fuse holder cap. On low faults the disc remains in place, restricting gases within the tube for maximum arc-quenching ability. On high faults the disc blows out and the cutout double-vents for maximum interrupting capacity.

The BV-33-F can be easily converted to a single-vented SV-33-F by replacing the pressure relieving cap with a solid cap.

For additional information on these new cutouts contact your local Southern States representative.

CHECK THESE INTERRUPTING RATINGS

KV	Continuous Current Amps	Interrupting Capacity RMS Amps
TYPE BV-33-F		
5	100	8,000
7.5	100	8,000
15	100	6,000
25	100	4,000
TYPE BV-33-FH		
5	100	10,000
5	200	10,000
7.5	100	10,000
7.5	200	10,000
15	100	8,000
15	200	8,000
25	100	5,000

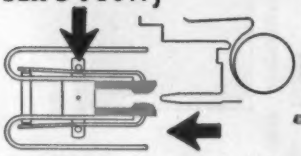
IN CANADA: Dominion Cutout Co., Ltd., Toronto

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

NEW! Revolutionary S&C Contact Cuts Cost of Switch Maintenance!

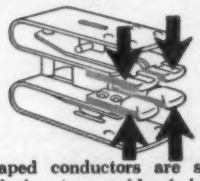
4-Point Advantage

SLIPS easily



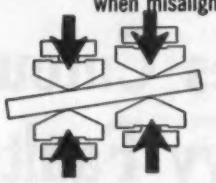
Tension bar and spacer prestresses contacts and reduces necessary force required to close contacts (effort at switch handle). Narrow convex silver-clad contact surfaces plow away any dirt from silver-nickel insert on blade tongue.

GRIPS at 4 points... not 2



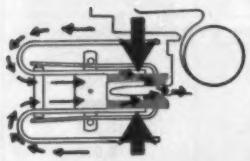
U-shaped conductors are split lengthwise to provide 4 independently sprung contact fingers. The pressure is applied to each by a flat beryllium copper loading spring.

GRIPS at 4 points... even when misaligned



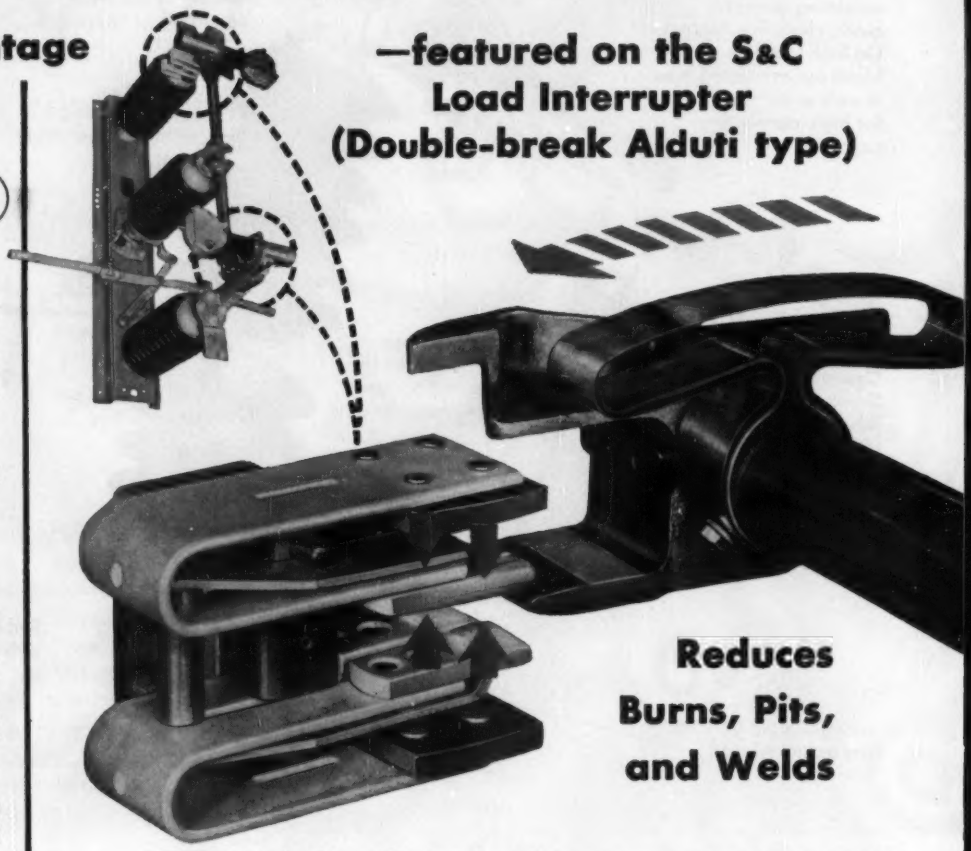
For 2 reasons: (1) Pressure is applied independently by springs in 3-point suspension which can rock and roll; and (2) pressure is applied equally on either side of blade by tension bar.

GRIPS harder... but only when needed



The reverse loop construction provides a magnetic field pattern during short-circuit current flow that causes repulsion and attraction forces to combine to produce heavier contact pressure when you need it.

—featured on the S&C Load Interrupter (Double-break Alduti type)



Reduces Burns, Pits, and Welds

NEMA standards specify the short-time current ratings for air switches and interrupter switches. And it is natural that equipment can be built to meet these requirements when new.

The big "if" is what happens in service.

You have found from experience that switches with conventional contacts must be carefully installed, and then continually maintained if they are to retain their original NEMA short-time ratings. As a practical matter such equipment generally gets little maintenance, and the short-time current capacity falls off.

You want a contact that meets NEMA standards after being in service, in spite of some misalignment in installation, and in spite of little maintenance. The Double-break Alduti has such a contact.

No more expensive contact maintenance work in the shop, dressing off burns and pits. No more worry about contacts welded shut after a momentary short-circuit loading. And the magneto-motive effect through the U-shaped contacts provides extra contact pressure when it is needed.

LIVE BETTER ELECTRICALLY

Specialists in High-Voltage Circuit Interruption Since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS • U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **Output predictions for this year are running 7.8 to 8.3% above 1956,** but these are dependent on some pickup in industrial activity and more severe weather in latter months than was encountered last year.

Winter peak load forecasts for this year are around 11% above last year. Main reason for the high figure is the comparatively low peak of last year. If based on the anticipated 1956 peak, this year's forecasts would be a little above 6%.

Chudoff committee is getting ready to jump into the investigation of electric utility advertising expenditures. Internal Revenue is already studying some advertising to see whether it qualifies as a tax-deductible business expense, but the Chudoff group is gunning for more headlines.

LATE NEWS ▶ **Florida Nuclear Power Group submits proposal to AEC** to build a 136,000-kw, natural uranium, gas-cooled, heavy-water moderated power reactor. It would cost about $40 million.

Former telephone lineman wins $250,000 suit against Long Island Lighting for injury resulting in amputation of his right arm. John Cooney, 29, charged the 2,400v LILCO line he grabbed was "dangerously close to the N. Y. Telephone Co wire" on which he was working. LILCO in turn accused NYT of negligence in not correcting the "dangerous" conditions of which LILCO had previously warned.

Hoosier Energy Co-op, Inc, a new G&T group formed by nine Indiana co-ops, is planning a 264,000-kw, 4-unit generating plant in cooperation with a Georgia aluminum firm, Richards & Associates. Richards will build a $7-million aluminum reduction plant nearby.

National Coal Assn's Executive VP Tom Pickett criticizes AEC for "promoting the myth" of future low-cost atomic electricity by concealing true costs of reactor construction.

Kidder, Peabody & Co offers 280,000 common shares of Central Hudson Gas & Electric Co at $15,625 a share . . . Florida Power Corp offers 255,913 common shares at $51 a share to its stockholders on 1-for-10 basis, record May 14 to expire June 3 with an over-subscription privilege . . . Equitable Securities group wins $6.5 million El Paso Electric Co first mtg 4¾% bonds (A) due 1987 at 100.07%; reoffers at 100.799% to yield 4.70% . . . Eastman Dillon, Union Securities group, wins 20,000 shares of El Paso Electric Co $100 par preferred stock at $100.007; reoffers at $102.857 to yield 5.25% . . .Halsey Stuart Co group wins $15 million Florida Power & Light Co first mtg 4⅝% bonds (Aa) due 1987 at 101.18%; reoffers at 102.046% to yield 4.50%.

Congratulations . . . John F. Rich is elected president and chief executive officer of New England Gas & Electric Assn, succeeding Floyd D. Campbell . . . Black Hills Power & Light ups Harry Z. Babbitt to chief engineer.

ELECTRICAL WEEK

A TWO-MINUTE

NUCLEAR POWER ▶ **We call it the period of "realism."** It is the time when nuclear power technology is shifting from the laboratory and the drawing boards to the plant sites. This shift brings numerous problems in fuel economics, in material selection, and in costs, but solutions to these and other vexing problems will come in time (p 94) . . . In the experimental stage, the boiling water reactor is showing up well (p 98) . . . Toughest of the new problems faced by nuclear plant engineers is raised by the radio-active emissions from working reactors. But general programs are already being evolved to afford maximum protection to operators and surrounding community (p 101) . . . For progress chart and latest check list on nuclear power developments, see our special report (p 93).

EVENTS ▶ **Survey shows purchasing agents want wide competition** for their buying dollars but also indicates restricted competition can work well for smaller companies. Full report on EEI Purchasing & Stores Committee meeting is found on page 78.

Neil G. Simpson is new head of Black Hills P&L. He rose to top with a simple but demanding formula: hard work (p 84).

Effective safety organization at Commonwealth Edison is centered in the industrial relations department and is really getting results. It has cut the 1954 accident frequency rate in half, and the trend is still downward. One key feature is an 11-man safety policy committee which helps put top management in the act (p 89).

WASHINGTON ▶ **Walter H. Sammis, Ohio Edison, and Louis V. Sutton, Carolina P&L,** urge Congress to retain control of TVA pursestrings (p 81). . . . Move is on to close out rapid tax amortization program (p 80).

ATOMIC PROGRESS ▶ **Electric power from fusion of hydrogen atoms** right now is something of a physicist's dream. First step in realizing that dream is being taken by 11 electric utilities which operate in Texas. They have set up a four-year, $10 million research program to determine whether the H-bomb reaction can be controlled for power plant use. . . . Back on atomic fission front, a new type atomic fuel pellet has been developed (p 83).

SUBSTATIONS ▶ **You can get up to 20% more kva out of self-protecting transformers** merely by increasing the secondary breaker settings. Recalibration of the breakers costs 76¢ each when done during overhaul (p 116).

DISTRIBUTION ▶ **Need a guide for service-drop installations?** Louisiana P&L has set up standards that simplify selection and application of service equipment. With a view to the future, the company standards provide adequate capacity for up to 2½ times initial load and aim for holding voltage drop between pole and entrance switch to 1%. Full standards are given in series of tables (p 90).

Here's a cable-laying rig that does everything—plows a trench, carries and feeds cable, backfills, rakes, and tamps. In use on a Long Island Lighting parkway job, the tractor and accessories enabled a single man to install 9,700 ft of lighting cable in a single day (p 113).

ELECTRIC HEATING ▶ **"Hotter than blue blazes."** That's the punch line for Washington Water Power's electric house heating campaign. Now that it is sure of a satisfactory power supply and can offer rates competitive with heating fuels, WWP is set to carry through the kind of promotion campaign that has given it a 90% saturation of ranges and water heaters. See how WWP debunks competitors' claims with an opening gun (p 120).

MANAGEMENT ▶ **Utility financing hit another heavy week** with around $85 million raised by four bond issues, one preferred stock, and two common stock issues. . . . "Bonds are going slow," says reliable Wall Street source. . . . Recent utility labor agreement calls for 6% wage increase . . . Florida Senate approves legislation which would tax publicly owned utilities for property held outside their home county . . . For details on these and other stories covering finance, rates, legislation, and employee relations turn to Management Bulletin (pp 161, 162).

PEOPLE ▶ **At Niagara Mohawk, these six become vice presidents:** R. H. Stratton, Frank T. McEvoy, Storrs M. Bishop, Frank M. Osta, Arthur W. Evans, and A. Floyd Wray . . . . At California-Pacific Utilities Lloyd E. Cooper is elected vice president. . . . At Worthington Corp Walther H. Feldmann is elected president (pp 168, 172).

MANUFACTURERS ▶ **Electric control equipment for first fully automatic reversing roughing steel mill** has been shipped. When installed for Jones & Laughlin, mill operator can control operations with just two push buttons. . . . Soot blower with 38-ft reach has been built for Union Electric. . . . Clever plant guide book put out by Leeds & Northup is adaptable for use in two separate plants merely by changing the fold. . . . Fused film coated wire makes smaller motors possible because of reduced thickness of insulation. . . . Mobile radio base station incorporates transistors to make equipment smaller, eliminate "desk clutter" (pp 153, 154).

NEW EQUIPMENT ▶ **Newly designed tapered pointers for volt meters, ammeters,** and other instruments enable operators to take accurate readings from many angles. They're for utility plant and mill use. . . . Demand meter kit, easily mounted on distribution voltage regulator, is intended for utility use in making feeder load surveys. . . . New line of multiple relays for control of street and highway lighting is introduced. . . . Fuse holder cap on distribution cutout has an expendable disc which remains in place on low faults, restricting gases, but is expelled on high faults (pp 128, 137).

ENGINEERING TRENDS

Shields will box in radio noise to circumvent RI and TVI of high-frequency equipment built by a major manufacturer for cementing automobile upholstery cushioning, and door panels. This is another step in an all-out campaign to keep potential interference confined to the production area.

Adding atomic fuel while carrying load will be possible in the new nuclear power plant of the Calder Hall type proposed for the South of Scotland Electricity Board. The new 320-Mw nuclear station will have a remotely controlled charge and discharge machine located beneath the reactor vessel.

Preservative injected into a living tree before it is felled uses the normal circulation of sap to attain distribution through a pole. European researchers seek to ascertain the optimum quantity of salts to inject, set up injection techniques, and ascertain the time required for proper distribution of the preservative.

Cable trouble trends upward, according to EEI data. Mechanical damage caused by cable movement accounts for 45% of the trouble during the latest year or slightly over half the known causes, which is typical of the 11-year period of the survey. As this movement is usually caused by loading cycles, the additional cases of trouble may well be counted part of the cost of heavier loading.

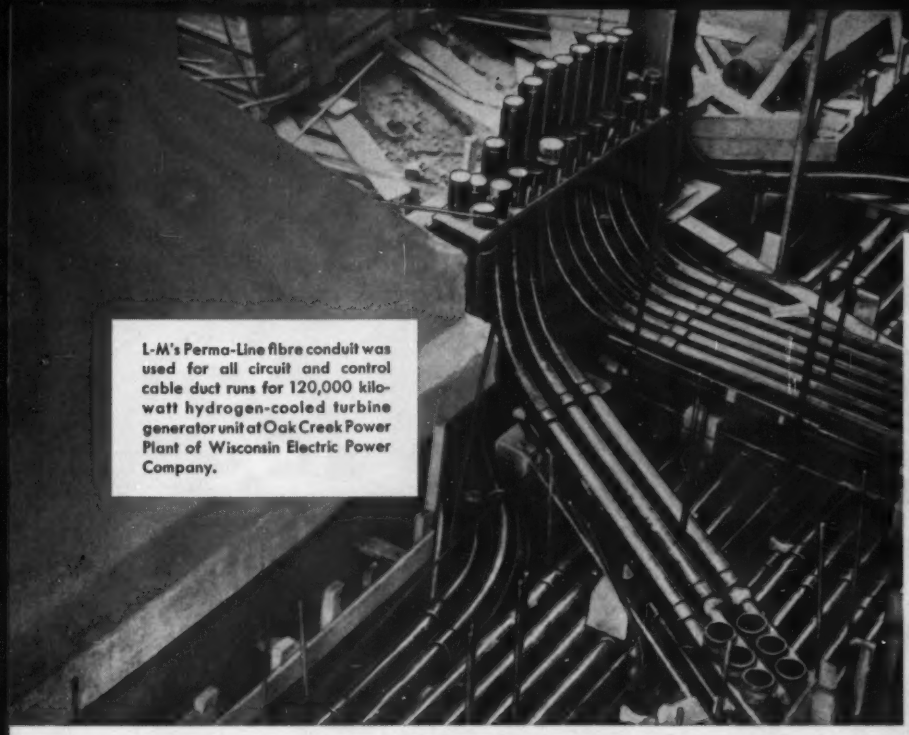
Dust deposition is small within 2 miles of a steam plant, and the rate bears no relationship to the amount of coal burned, according to a British survey reported by The Electric Journal.

FROM EDITORS IN THE FIELD

Converting 200 circuit miles of distribution to 12.47 kv and supplying a substantial amount of 4.16 kv through step-down transformers has brought Narragansett Electric Co few troubles peculiar to the higher-voltage system. Occasional transformer bushing flashovers caused by inquisitive squirrels, for example, have been overcome by applying Neoprene terminal caps.

Aerial power cable is attached to building walls in one Western city because basements extending under sidewalks left no place for poles.

A 4-in.-square washer welded to shoulder gives a steel pin more area to bear on a crossarm. Florida Power uses this modification to strengthen single arms at angles in distribution lines, thereby avoiding the cost of double-arm construction.



L-M's Perma-Line fibre conduit was used for all circuit and control cable duct runs for 120,000 kilowatt hydrogen-cooled turbine generator unit at Oak Creek Power Plant of Wisconsin Electric Power Company.

Above, L-M's Perma-Line fibre conduit is being installed in the Burleigh Substation, Wisconsin Electric Power Co. Duct has smooth inner bore and smoothly rounded bell ends in manholes so cable sheath will not be cut or marred.

L-M's Perma-Line™ Conduit Assures a Lifetime of Trouble-Free Service

L-M's Perma-Line fibre conduit is manufactured within close tolerances and according to rigid test requirements to assure trouble-free service for all generating station, substation, and underground system applications.

L-M's Perma-Line is corrosion-, vermin-, and leak-proof. It has an unusually high tensile strength. Joints are quickly and easily made by simply tapping the tapered coupling onto the tapered end of the conduit. Joints are watertight and safe from seepage of wet concrete and soil water. L-M conduit's smooth inner bore makes cable easier to pull and reduces cable sheath abrasion. Fibre conduit comes in long lengths. It's light, easy to handle; and you'll find it can be laid faster than many other types of ducts.

Complete Accessories

Prefabricated base and intermediate spacer units are available to keep installations rigid and evenly aligned. Spacers have special locking feature to make any combination of duct configuration.

L-M provides a variety of bends and angle couplings, including 5° angle coupling, S-bend, 45° and 90° bends. The 5° angle coupling provides for long radius turns and offsets; S-bend provides a 20" offset. Special bends are available on order.

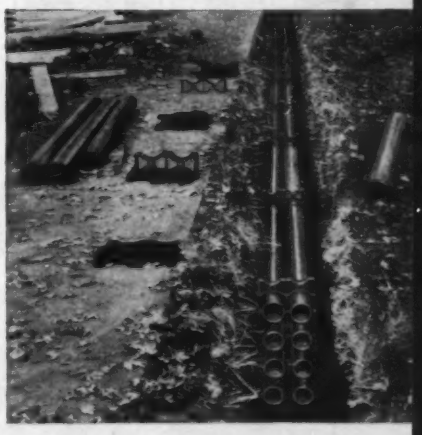
Bell ends for use at conduit terminals in manholes provide a smoothly rounded opening that will not cut or mar the cable sheath.

Fibre caps provide a watertight, vermin-proof seal for conduit lines prior to drawing cable. Easy to remove for reuse.

L-M Perma-Line fibre conduit is available in 5-foot lengths, sizes 2, 4, 5, and 6 inches; also 8-foot lengths, sizes 3, 3½, 4, 4½ and 5 inches.

Get Complete Information

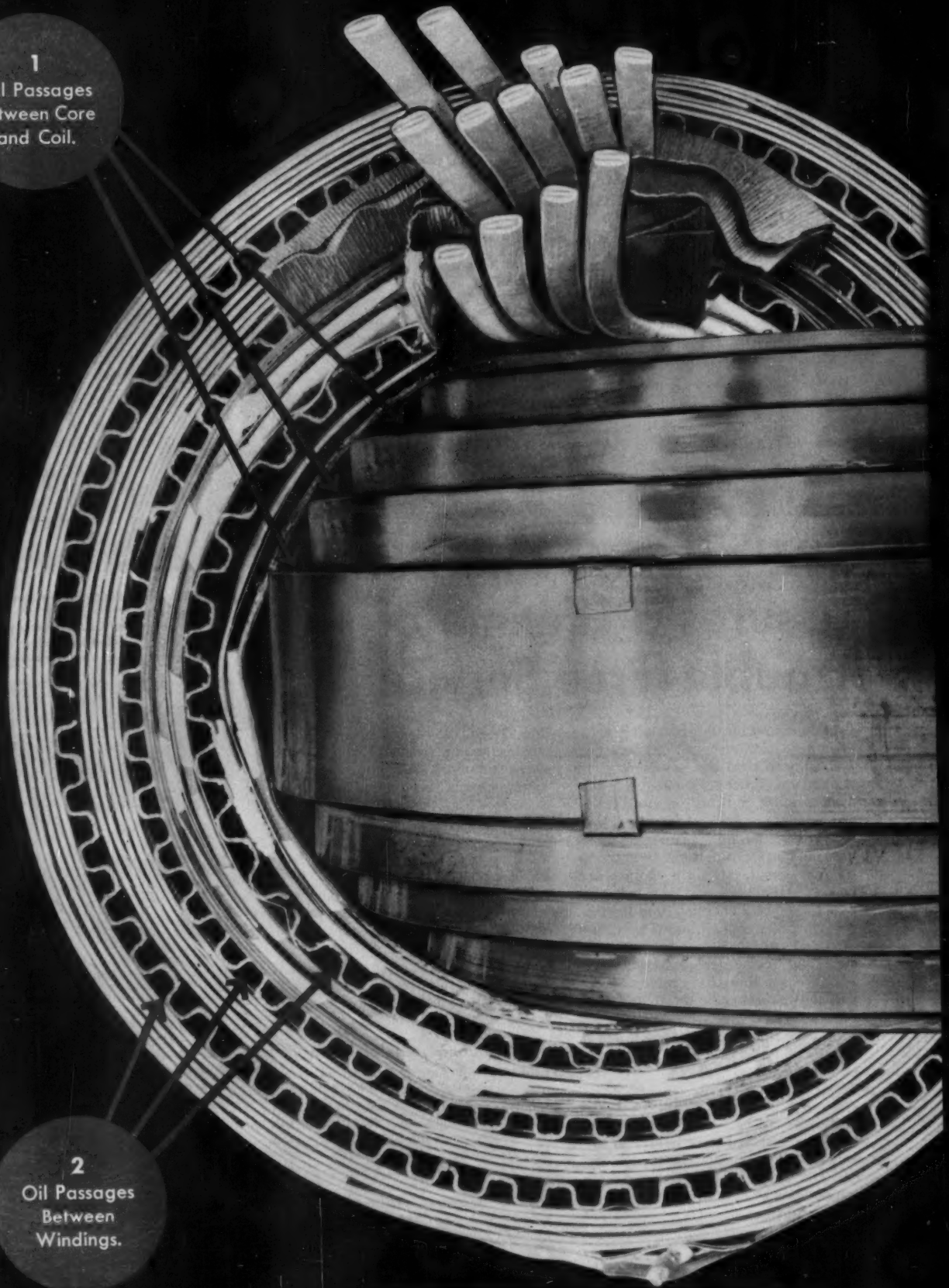
L-M offers a completely engineered system for conduit installations. Ask the L-M Field Engineer for a copy of the 12-point plan folder, which shows how easy it is to use our system; also for L-M's underground construction handbook and Bulletin UG1A, which gives complete specifications. Or write Line Material Industries, Milwaukee 1, Wisconsin (McGraw-Edison Company).



It is easy to construct a solid, well-aligned installation with L-M's Perma-Line fibre conduit and easy-to-use accessories. The illustration above shows use of L-M base and intermediate spacers, to assure firm, even spacing.

L-M's new tapering tool and fibre conduit vise duplicates the smooth, precision factory-cut tapers in the field. It pays for itself through savings from 100% salvage of field-cut ends.

LINE MATERIAL
Fibre Conduit



L-M Round-Wound transformers have large, unobstructed areas exposed to cooling oil between core and coil (1), between windings and layers (2), and on the outside of the coil. The result is appreciably lower hot-spot temperature—high short-time overload capacity.

Here's Why

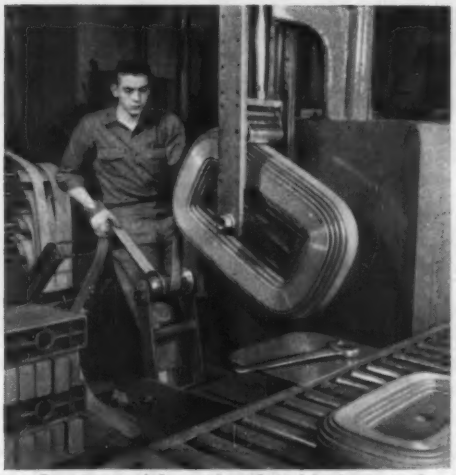
L-M's Round-Wound® Core-Coil Design Gives High Performance

By **A. C. WURDACK**
Chief Engineer
Large Distribution Transformers
Line Material Industries

L-M's wound-core, round-coil construction provides the most efficient design for obtaining balanced transformer performance characteristics.

Low Losses

The transformer core consists of a tightly wound, continuous strip of high-grade oriented steel. The core is not cut, unwound, or disturbed in any way after annealing. This results, therefore, in low exciting current, low core loss, and high magnetic efficiency.



Core is wound from strips of steel having several different widths, resulting in a cruciform cross-sectional area approaching an ideal round shape.

L-M's Round-Wound core permits the effective use of a round coil which has a much smaller perimeter than a coil placed around a rectangular core of the same cross-sectional area. L-M's design, therefore, permits smaller turn diameters, resulting in lower impedance and better regulation at all power factors.

High Short-Time Overload Capacity

L-M's Round-Wound transformers have natural oil passages between the cruciform cross-section core and round coil (1) to provide the greatest possible exposure of coil surface area to cooling oil. In addition, duct spacers placed between windings (2) and between layers in most sizes provide additional oil circulation. L-M's core-coil construction, therefore, provides more efficient dissipation of heat from the coils to the oil. The results are lower hot-spot temperatures, and higher overload capacity, or greater over-all life of the transformer.

L-M's round coils are wound directly onto the uncut core. No mallet ing is required to shape. Long creepage distance between windings and between leads, gives higher impulse strength.

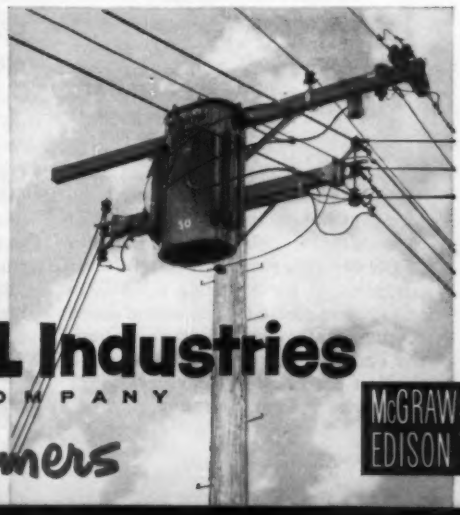
High Short-Circuit Strength

Under short circuits, rectangular coils tend to distort to a round shape, with resultant insulation damage or failure. L-M's round coils are not subject to this distortion when under heavy short-circuit currents, because the coils are already circular in shape. The radial forces are distributed evenly, with little or no effect on the coil. Sturdy clamping structure and varnished coils provide strong mechanical support to prevent axial movement.

Another advantage is L-M's new obround tank design. The transformer is smaller, lighter, and has shorter moment arm distance from the pole.

Get Complete Information

Ask your L-M Field Engineer for complete information on L-M Round-Wound transformers. Or write Line Material Industries, Transformer Division, Zanesville, Ohio.

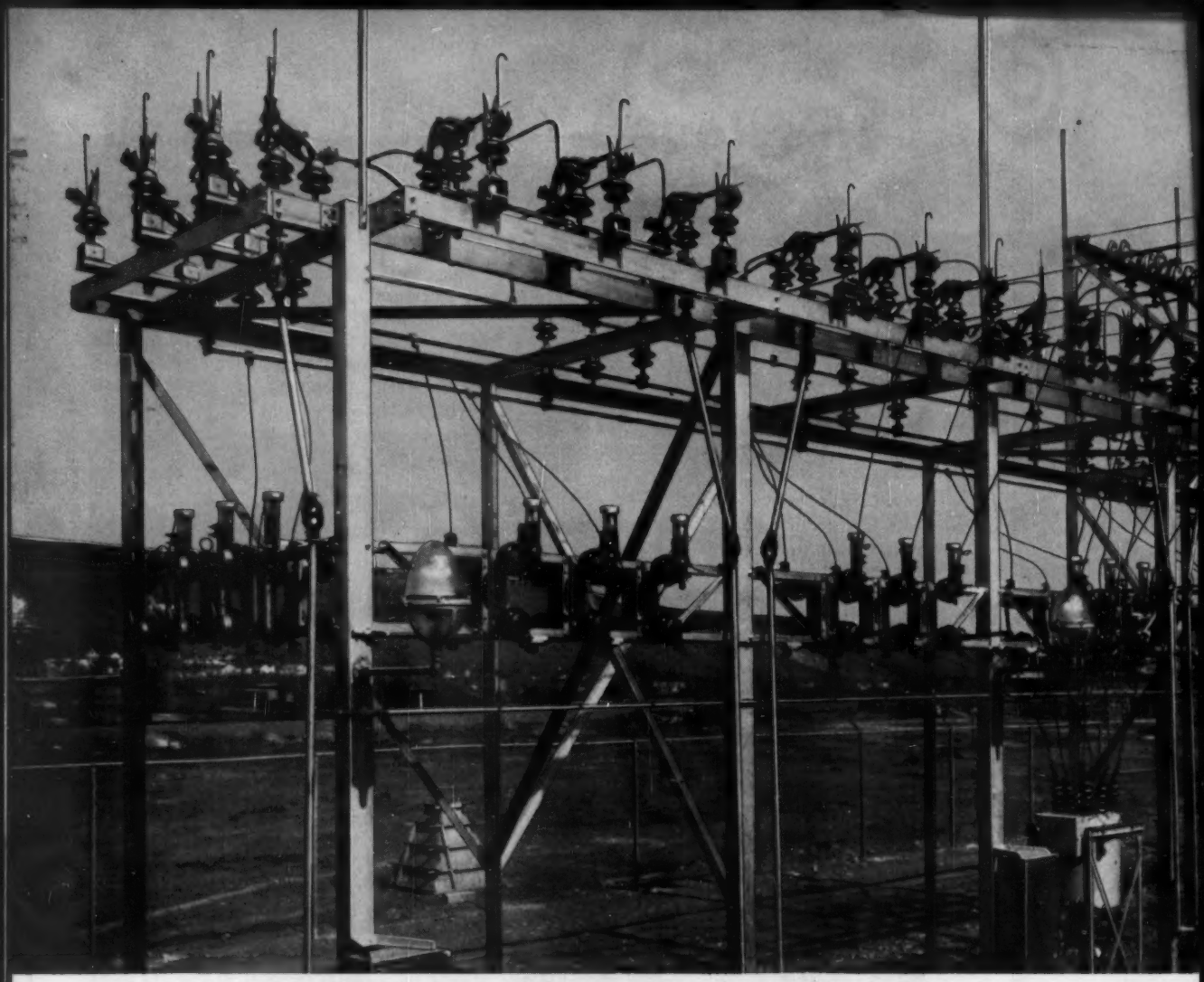


LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Transformers

McGRAW EDISON



Nine L-M power switches and 20 hook switches at the 13.8 kv 20,000 kva switching center of a Northwest utility. L-M also furnished other equipment and apparatus.

How L-M Switch Design Insures High Thermal Capacity, Positive Operation

High-pressure silver-to-silver contacts provide cool operation; powerful lever advantage to open and close switch insures easy operation at all times.

by **HARVEY BAERWALD**
Sales Application Engineer
Power Switching And
Substation Section
Line Material Company

Line Material has designed high thermal capacity and trouble-free operation into its line of power switches. Powerful lever advantage of the operating mechanism and silicone-grease-lubricated and sealed bearings at all moving joints insure positive operation to open or closed switch position regardless of ice, corrosion, or long periods of non-operation.

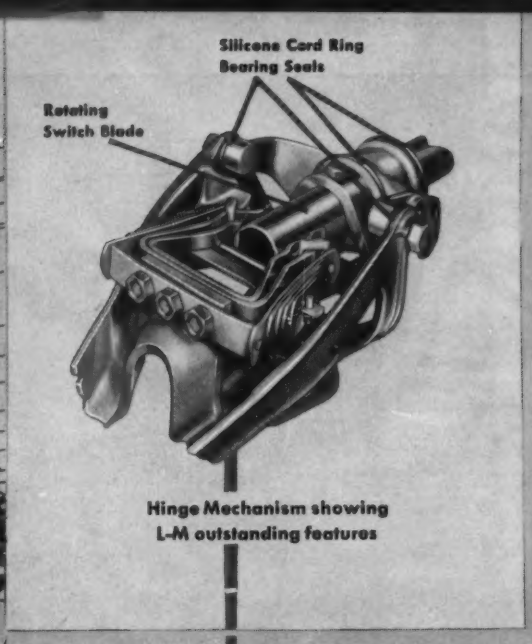
Tremendous Lever Advantage

Operating mechanism provides a tremendous lever advantage by utilizing unique rotating switch blade design. Before the blade even begins to rise in the contacts, it is rotated 26 degrees—the full force is applied to blade rotation, breaking any possible condition of ice, corrosion, or contamination.

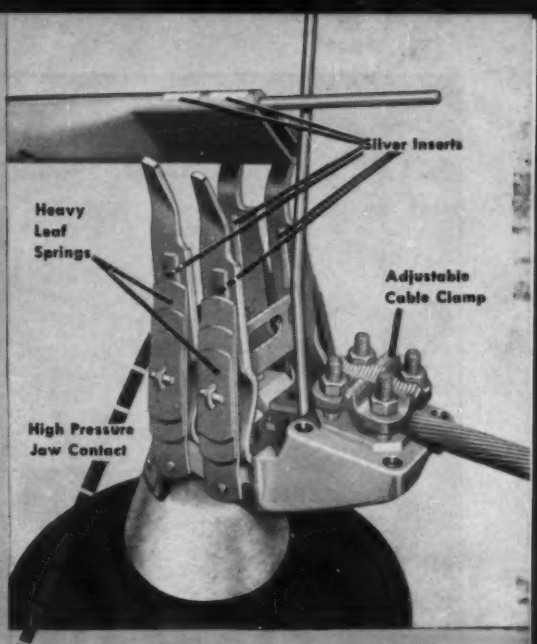
Smooth, Easy Operation

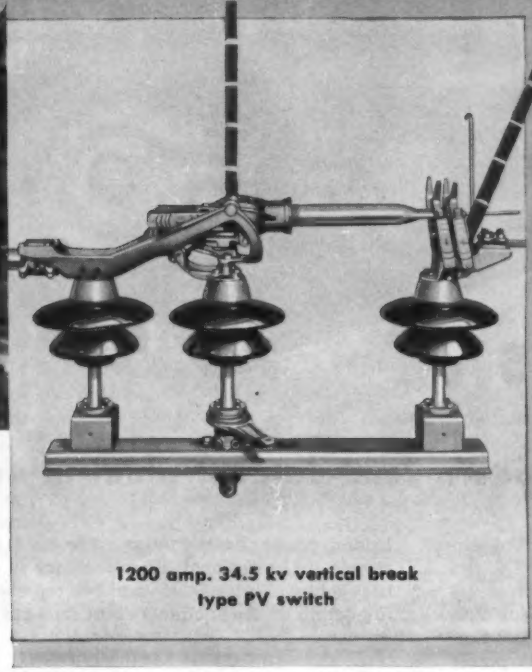
The hinge operating mechanism also provides smooth, positive blade rotation and blade rise. All bearings and all moving joints on the switch and on the interphase mechanism assembly are silicone-grease-lubricated for life and positively sealed with silicone cord rings.

LINE MATERIAL
McGRAW-EDISON COMPANY

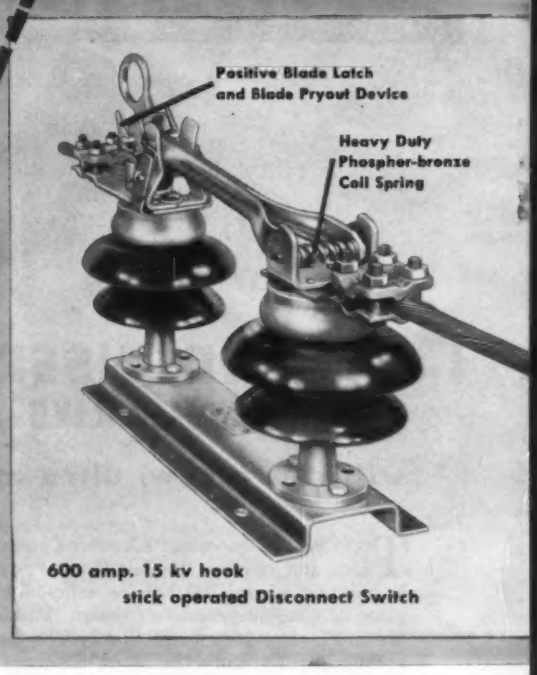


Hinge Mechanism showing
L-M outstanding features





1200 amp. 34.5 kv vertical break
type PV switch



600 amp. 15 kv hook
stick operated Disconnect Switch

Grease can't get out; water, dust, or dirt can't get in to freeze or start corrosion.

On 69 kv ratings and above, a counterbalance spring is provided to counteract blade weight. It is a self-centering, double coil, floating spring which is positive acting and trouble-free.

High Thermal Capacity

L-M's power switching equipment provides extremely high thermal capacity for both continuous current and short-time high current carrying applications.

Silver inlays in both blade and contact shoes insure high current-carrying capacity at both jaw and hinge contacts. During the closing operations, blade rotation provides a wiping action assuring clean silver-to-silver contact surfaces.

The jaw contact assembly has large copper shoes which exert 175 pounds pressure on the silver-to-silver contacts. This high pressure is maintained by heavy leaf springs to provide uniformly high thermal capacity.

L-M's power switches also have fewer current interchange points because the terminal connectors are designed as an integral part of the contact adapter.

Simple Construction

Turnbuckle interphase adjustments make L-M group-operated switches easy to install. Flexible interphase mechanism assures positive operation without periodic maintenance, even after the structure has become severely distorted.

Get Complete Information

Ask your L-M Field Engineer for information and bulletins on L-M's Power Switching Equipment. Or write Line Material Industries, Milwaukee 1, Wis.

Power Switching Equipment

266-R

I-R CONDENSERS AND AUXILIARIES

will serve new, ultra-modern semi-outdoor plant in Arizona

TO SERVE the booming "Kilowatt Country" of Arizona and vicinity, the Salt River Power District is building a new 200,000 kw semi-outdoor steam plant of completely modern design. This Agua Fria Steam Plant, under construction by The Bechtel Corporation, will feature the latest advances in power plant technology, including closed-circuit television for boiler room supervision.

Each of the station's two 100,000 kw turbo-generator units will be served by an Ingersoll-Rand 50,000 sq. ft. rectangular surface condenser. Auxiliary equipment includes I-R condensate and circulating pumps and steam-jet ejectors.

Here, as in all Ingersoll-Rand steam plant equipment, maximum service continuity and long-range *dependability* are primary factors in design and construction. The performance of similar equipment, in leading power plants from coast to coast, has demonstrated its exceptional life-expectancy in continuous, heavy-duty service. Ask your I-R representative for full details on the equipment best suited to your needs.

INGERSOLL-RAND EQUIPMENT FOR THE AGUA FRIA STEAM PLANT —

2 Rectangular Surface Condensers, each 50,000 sq. ft. single-pass, vertically divided.

2 Steam-Jet Ejectors, twin-element, two-stage with surface type inter- and after-condensers.

4 Vertical Condensate Pumps, each a three-stage unit rated 1400 gpm, 250 ft. head.

4 Horizontal Circulating Pumps, each a single-stage double-suction unit rated 41,000 gpm, 57 ft. head.

4-427

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

1945

THE FIRST . . . **FISHER-PIERCE PHOTOELECTRIC LIGHTING CONTROL**

. . . THE LATEST

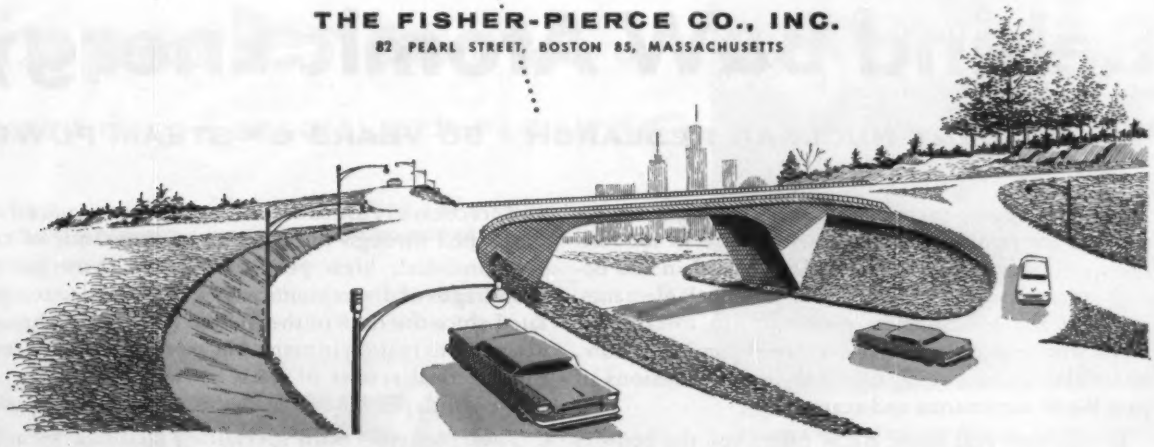
1957

The year World War II ended, The Fisher-Pierce Company began work with utility engineers to develop photoelectric controls. Automatic, dependable switching of street lighting circuits when illumination was needed, regardless of time of day, season or weather, was the fundamental idea. The Series 61300 was the first of five different, major groups of F-P controls that have followed.

The experience has proved valuable to Fisher-Pierce and customers alike. Backed by an organization of more than 650 people, F-P today offers photoelectric lighting controls for all purposes . . . extensive sales and engineering services . . . research, development and production facilities to solve specific photoelectric/electronic equipment problems you may have. Your inquiry about F-P products, who uses them, and how you may use our development facilities for your own electronic equipment requirements, is welcomed.

THE FISHER-PIERCE CO., INC.

82 PEARL STREET, BOSTON 85, MASSACHUSETTS



B&W Nuclear Facilities Plant in Lynchburg, Virginia, showing new expansion program under construction.

Behind B&W Atomic Energy

INDEPENDENT NUCLEAR RESEARCH • 90 YEARS OF STEAM POWER

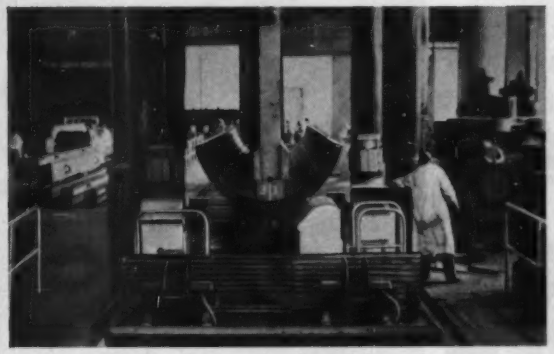
Many of the components in nuclear steam generating systems are remarkably like those in use in modern conventionally-fueled power plants. And in the design and fabrication of reactors and fuel elements, many of the solutions to problems—in metallurgy, metal working techniques, heat transfer and fluid flow, and welding—are being found through extensions of past B&W experience and research.

In this very real sense B&W offers you the benefits of 90 years of experience in design, fabrication, testing and erection . . . the skills and techniques acquired and developed through the creation of thousands of conventional-fuel, high pressure boilers. You get the advantages of direct atomic energy experience accumulated since the days of the Manhattan Project through active participation in many AEC-sponsored projects . . . the practical results of B&W's own continuing program of independent nuclear research and development.

These, together with specialized facilities, form the unique background B&W brings to single compo-

B&W Critical Experiment Laboratory, Lynchburg, Virginia.

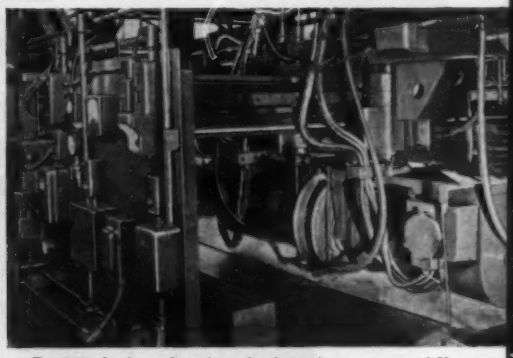
Massive draw bench produces heavy-wall, large-diameter hollow forgings.



8500-ton hydraulic press bends and forms heavy plate, pierces ingots.

This high-speed digital computer helps speed computational work in reactor core design.

A continuing program of independent nuclear research is carried on at B&W's Research Center at Alliance, Ohio.



B&W-designed electrical-resistance welding process clads base plate with alloy sheet.

Experience....

EXPERIENCE • SPECIALIZED FACILITIES

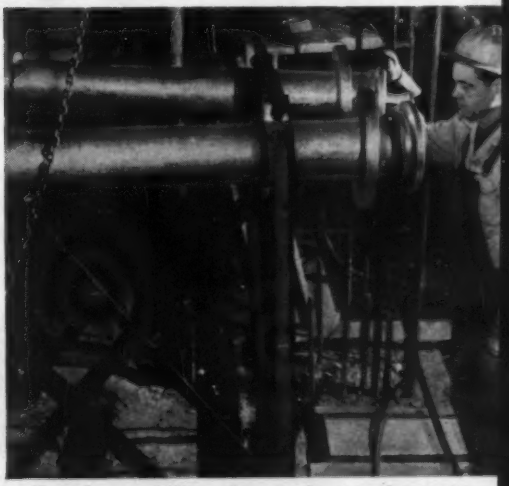
nents, or the design, fabrication, testing and erection of complete nuclear steam generating systems, from fuel elements to turbine throttle.

The Babcock & Wilcox Company, Atomic Energy Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

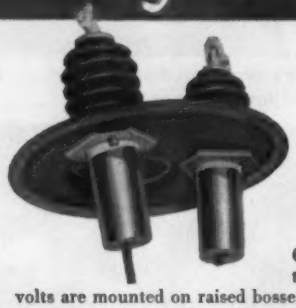
ATOMIC ENERGY DIVISION

AE-40-A



Experience, skills and tools developed over 90 years are applied to design, fabrication and erection of nuclear steam generators.

Wagner Form W Pole-Type Transformers
designed for modern distribution systems



HIGH VOLTAGE BUSHINGS

Cover mounted bushings on transformers above 5000 volts are mounted on raised bosses to provide a perfect gasket seat—water drains off quickly.

SHUR SEAL COVER CLAMP

The spring action of the tank lip and Shur Seal clamping ring keeps gasket under uniform pressure to seal transformer air-tight. Cover is easily removed—only one bolt to loosen.

DOUBLE LOCKED LOW VOLTAGE BUSHINGS

Porcelain is key-locked to tank wall, terminal is key-locked in porcelain to prevent turning when connections are made. No loose connections—no internal short circuits.

SAFETY H.V. SIDEWALL BUSHINGS

Sidewall high voltage bushings on transformers below 5000 volts are also double locked. Chuck type terminal with insulated hand knob permits safe, easy connections without the use of tools.

Only Wagner offers all these important features...PLUS

TERMINALS
Suitable for use with either copper or aluminum conductor.

DOMED COVER
Provided with big enough hand hole to get to the tap changer easily.

STEEL TANK
Light, strong, seam welded sheet steel tanks have recessed tank bottoms.

DURABLE FINISH
All tank surfaces are sand-blasted and given three coats of individually baked-on paint.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6436 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS • AIR CONDITIONING EQUIPMENT

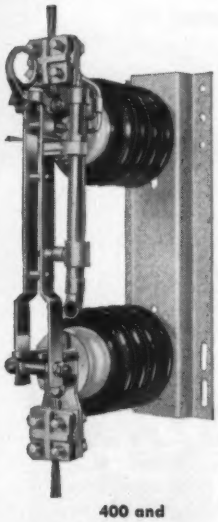
new design for even more dependable service

Modern and reliable in every detail! New extra wide hinge and sturdy blade construction assure blade always hitting upper contact when closed from any practical angle. Design of current-carrying parts prevents misalignment from wear and distortion of blades. Non-current carrying hinge; positive blade lock; high leverage pry-out.

400 and 600 Amp. Single Throw

KEARNEY HOOK OPERATED DISCONNECT SWITCHES

Electrically and mechanically, KEARNEY Disconnect Switches have proved themselves under the most rigorous test-laboratory and field conditions. This new design embodies all the service-proved features, providing dependability and simplicity of operation.

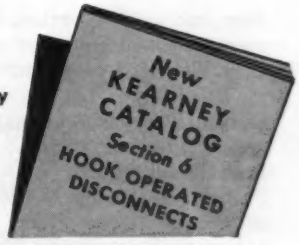


400 and 600 Amp.

CURRENT BREAK DISCONNECT

Conventional disconnect and safe, low-cost interrupter of line charging or transformer exciting current. One pull of switch blade performs both operations in correct sequence. Arc is broken and extinguished inside Arc-rupter—not at switch contacts. Its 30 Amp. interrupting capacity is adequate to break no-load current of most feeder circuits or distribution transformer banks. Interruption of exciting current completed safely with no arcing at disconnect contacts. Closing disconnect in normal manner readies it for another operation.

New! **Do you have your copy of this new KEARNEY Catalog section on Disconnects? If not, write direct today!**



JAMES R. KEARNEY CORPORATION • *General Offices:* 4224-42 Clayton Ave., St. Louis 10, Mo. 364

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

JAMES R. KEARNEY

The Mark of Quality

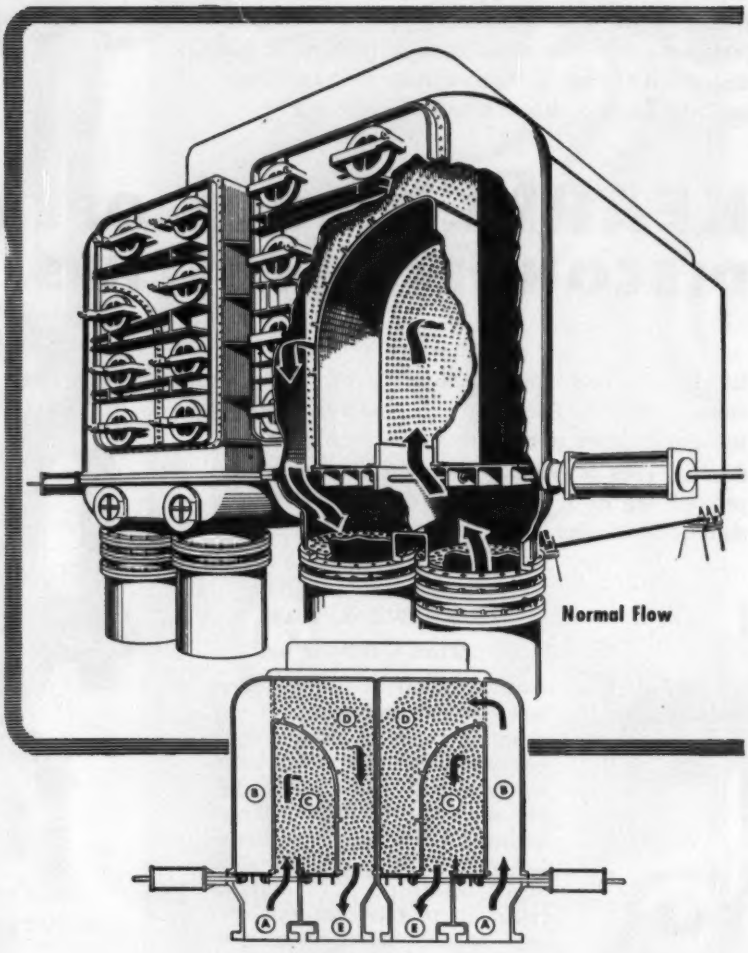
KEARNEY PRODUCTS

REVERSE FLOW by C. H. WHEELER
Cleans Steam Condenser Tube Sheets Without Loss of Load

When debris and organic growth collect on the tube sheets of a C. H. Wheeler Patented Reverse Flow Steam Condenser, you don't have to shut it down for cleaning. It cleans itself—without loss of load. Sluice gates arranged within the condenser may be controlled, either electrically or hydraulically, to reverse the flow of cooling water through the tubes. This sudden reverse flow literally flushes away leaves and debris, dislodges crustaceous matter from clogged tubes.

Because of 100% water flow during back flushing, there is only a negligible dip in vacuum momentarily, thus permitting continuous load on the turbine The Reverse Flow Condenser cleans itself in minutes, compared with hours of downtime when tube sheets are manually cleaned. A typical report shows a half-inch loss of vacuum (due to fouled tubes and tube sheets) was restored in five minutes after reversing the flow of cooling water. Often, a C. H. Wheeler Reverse Flow Condenser goes two years or more without shut down for cleaning, depending on the condition of the cooling water.

New, exclusive deaerating features and construction techniques help make C. H. Wheeler Steam Condensers "First in Efficiency." Let C. H. Wheeler Custom Engineer your next steam condenser. Phone or write C. H. Wheeler Manufacturing Co., 19th & Lehigh, Philadelphia 32, Pa. . . . Manufacturers of Steam Power Plant Condensers • Vacuum Equipment • Marine Auxiliary Machinery • Water Supply, Drainage and Circulating Pumps.



HOW "REVERSE FLOW" WORKS

Left Side Shows Normal Operation

Water enters inlet A with right port open. Flows through tube bank C to rear of condenser . . . returns through tube bank D to front of condenser and discharges at E.

Right Side Shows Reverse Flow

Sluice gates move on a common stem. Water flows up through channel B, and through tube bank D to rear of condenser . . . returns through tube bank C to front of condenser.

In the C. H. Wheeler Divided Water Box Design, each half of the condenser can be back-flushed independently.

WE603

C.H. Wheeler OF PHILADELPHIA

Where is the Guy who put up this guy?

He's doing something else—
maybe he's putting up another one.
Anyway, he did this job all alone
in less than five minutes—
by himself.

STRANDVISE is made
for strand sizes 3/16", 1/4", 5/16", 3/8", and 7/16"
NO MATTER THE GRADE.
Please pick your size, fill in
the coupon and mail it today.

Reliable

Reliable Electric Company
West Carroll Avenue
Chicago 12, Ill.

Mr. Reliable:

WE DON'T BELIEVE IT BUT—we want to give STRANDVISE a fair trial. You may send 4 of them size ( ) without charge. Better send your instructions for installing and a catalog-price sheet, too.

Signed_____

Company_____

Street No._____

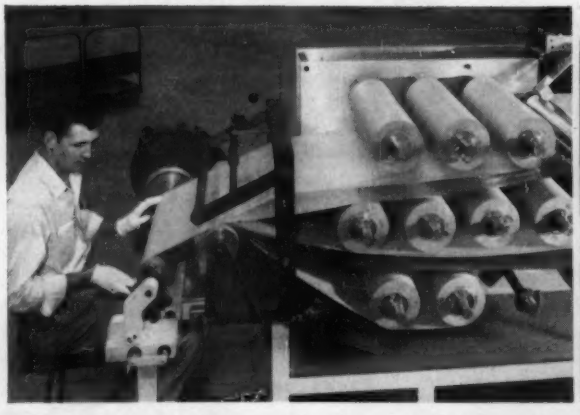
City_____ State_____

This STRANDVISE guy was put up complete before any tensioning tools were applied to the strand

NOW...SANGAMO

Small in size
Light in weight
Easy to handle
Easy to mount

INCREASED PRODUCTION FACILITIES



Dielectric packs are wound under controlled atmospheric conditions to eliminate any possibility of contamination.

This modern Sangamo plant in Pickens, South Carolina, now supplements the Illinois facilities for capacitor production.

SECONDARY CAPACITORS!

to release transformer capacity, reduce losses, and improve voltage levels on secondary circuits

Sangamo secondary voltage rated capacitors are built with the same processing care and to the same high standards that have put Sangamo Diaclor Primary Capacitors on the "approved list" of most major utilities in two short years. They are built to distribution engineer's specifications—with *all the features you want* to meet your service requirements.

CORROSION-RESISTANCE THAT'S MORE THAN SKIN DEEP—Cylindrical cases are of all welded steel construction, with mounting supports brazed to the case. There are no pockets to accumulate dirt or moisture. Tin plating, aluminum metallizing and two coats of baked vinyl resin base paint provide corrosion resistance even when case is scratched.

CYLINDRICAL DESIGN WITH HIGH PURITY KRAFT PAPER AND ALUMINUM FOIL—Provides an efficient unit with minimum weight and size. Elimination of foil tabs prevents possible injury to paper.

SPECIAL DIACLOR IMPREGNATION FOR STABILITY OVER A WIDE TEMPERATURE RANGE—These capacitors operate at temperatures from –40°C to +46°C.

INTERNAL DISCHARGE RESISTOR TO PROTECT LINEMEN—Reduces residual voltage to 50 volts or less in one minute.

PERMANENT HERMETIC SEAL WITH SOLDER SEALED BUSHINGS—Wet process porcelain bushings, metal bonded to the case, provide gasketless seal. Clamp type terminals are of tinned copper alloy, can be used with any type of conductor.

UPRIGHT OR INVERTED SWIVEL MOUNTING—Enables best utilization of available pole space.

Order from your Sangamo Representative, or write us for complete information and prices.

240 VOLTS, 60 CYCLE, SINGLE-PHASE

Size	Diameter	Overall Height	Net Weight
3 KVAR	5-7/16"	15-3/8"	18 lbs.
5 KVAR	5-7/16"	21-3/8"	28 lbs.

PC57-2

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

FURNISHED WITH POLE MOUNTING BRACKET THAT PERMITS LAG SCREW MOUNTING TO POLE—Standard EEI-NEMA cross-arm mounting bracket can be furnished when specified.

GROUNDING LUG—A grounding clamp for up to No. 2 solid wire is part of the mounting-bolt assembly.

LEADS—Two 48-inch, 600 volt insulated flexible copper leads are furnished.

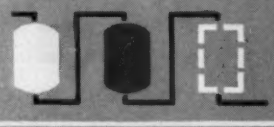
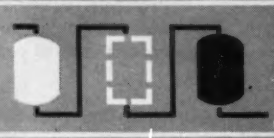
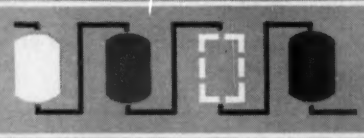
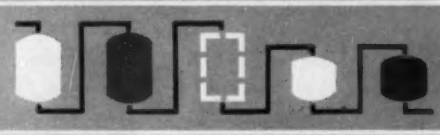
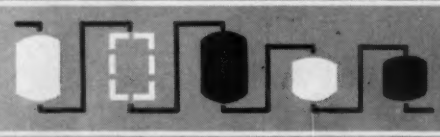
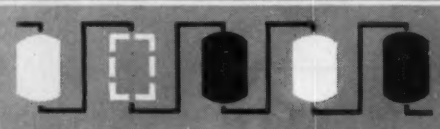
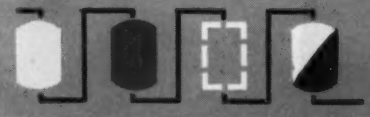
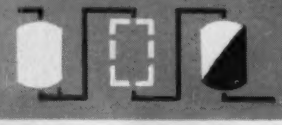
INDICATING FUSES—Integrally mounted with the leads, can be furnished at extra cost. Fuse waves a red flag as positive signal for outages—stays intact after operation.

9 ways to demineralize water

(BY ION EXCHANGE)

KEY:

- Hydrogen Cation Unit — Removes metallic cations such as calcium, magnesium, sodium. Regenerated with sodium for simple water softening.
- Weakly Basic Anion Unit — Removes strongly ionized acids such as sulfuric, hydrochloric, nitric.
- Strongly Basic Anion Unit — Removes strongly ionized acids, also weakly ionized acids such as silicic and carbonic.
- Mixed Bed Unit — Contains both Hydrogen Cation and Strongly Basic Anion Exchangers, intimately mixed.
- Degasifier — Optional. Reduces load on Strongly Basic Anion Exchanger by removing free CO_2 brought in by raw water or developed in cation unit.

A	 Effluent Conductivity—10 to 20 micromhos (no silica reduction)	Uses low-cost anion exchanger and anion regenerant (soda ash). Typical use—removing soluble salts from water for ceramic mixes and slips or from rinse waters used before painting, mirror silvering, etc.
B	 Effluent Conductivity—same as A. Silica content—0.02 to 0.15 ppm.	Used for treating feedwater for boilers in general range of 600 to 1400 psi. Also (without degasifier) for removing impurities from plating baths and recovering chromate from plating rinses.
C	 Same effluent as B.	For raw water with high sulfate and chloride content. Low-cost Weakly Basic Anion Exchanger removes major portion of electrolyte load. Countercurrent regeneration of anion units reduces operating costs.
D	 Effluent Conductivity—3 to 5 micromhos. Silica same as B.	For same type of raw water as C. Countercurrent regeneration of both cation and anion units cuts operation costs.
E	 Effluent Conductivity—1 to 5 micromhos. Silica same as B.	For waters where alkalinity is a major part of the anion content. Polishing units require infrequent regeneration. Produces, at low cost, low-solids feedwater suitable for high pressure boilers (over 1400 psi).
F	 Same effluent as E.	High flexibility of operation. Can operate in parallel for peak flows. Can maintain service flow during regeneration of either pair of units.
G	Effluent Conductivity—less than 1 micromho. Silica same as B.	Produces effluent of extremely high quality. Suitable for "super critical" pressure boilers and atomic reactors. (Initial and operating costs are usually higher than for separate anion and cation units.)
H	 Same effluent as G.	For raw water with high sulfate and chloride content. Two-step demineralizer reduces load on Mixed Bed unit, cuts operating cost. (Strongly Basic Anion Exchanger is used in place of Weakly Basic where raw water has high silica and alkalinity.)
I	 Same effluent as G.	Recommended where alkalinity of raw water is high. Cation unit and Degasifier reduce load on Mixed Bed unit, cut operating costs.

All of the above systems, with equipment and resins made by Permutit, are in commercial use. Other combinations are possible—also use of special ion exchangers such as PERMUTIT SK for separating uranium oxide from other metallic oxides in ore.

Most of these systems (C and higher) are used almost exclusively for demineralizing feedwater for high-pressure boilers . . . but the list of possible applications in other fields is growing.

If you have a problem ion exchange might solve, we'll be glad to study it with you and bring you the benefits of this experience. Address: The Permutit Company, Dept.EW-5,330 West 42nd St., New York 36, N. Y.

PERMUTIT®

rhymes with "compute it"

ION EXCHANGE for Water Conditioning
Chemical Processing • Industrial Waste Treatment

YORK-HOOVER announces

the new RANGER unit

for heavy duty line work

The Ranger derrick incorporates an expanding center leg designed for efficiency and safety under heavy loads. Its companion YB pressure digger will operate readily under conditions until now thought impossible.

Get the complete "Ranger" story today! Write for Bulletin No. 944.

"Work Rated" hydraulic derrick

Hydraulic pressure digger for normal and tough "spot" digging.

Combination hydraulic and mechanical winch drive.

Hydraulic self storing jacks.

Built-in generator for electric power tools.

Rugged body construction designed for tough usage, safety and comfort.

BODY DIVISION

YORK-HOOVER CORPORATION

YORK, PENNSYLVANIA

CREATIVE ENGINEERING FOR THE PUBLIC UTILITY INDUSTRY SINCE 1892

SOUTHWIRE serves the world

the plant that customers built

AERIAL VIEW of Southwire's expanded facilities which now occupy over 200,000 square feet.

Southwire's greatly expanded plant means more products, faster service

Our customers are responsible for Southwire's rapid growth from a plant of 10,000 square feet in 1951 to the present one of 200,000 square feet. For this we are grateful.

But it took two things to get the customers and hold on to them: *quality products and superior service.*

Today the name Southwire is known from coast to coast and in many foreign lands. It applies to dozens of products used in transmission and distribution systems, and in the building industry.

The greatly expanded facilities of Southwire stand not only as a tribute to our customers, but as a promise of greater things to come: a wider range of present products, the development of new products, and a continuation of the policies that have built solid customer satisfaction.

Specifying Southwire is your best assurance of quality and service, plus a full measure of gratitude from all the men and women who make up the Southwire Company.

• products produced for the electric and allied industries

Southwire® Company

TErrace 2-6311 CARROLLTON, GEORGIA

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and Southwire Vinyl Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Your Westinghouse representative can prove...

NEW TRANSFORMER DESIGN ELIMINATES 18 SOURCES OF CORROSION

Dome cover with new eye-bolt I-beam construction plus new internally mounted H. V. and L. V. bushings eliminate corrosive hardware. Patented "Coastal Finish"—toughest, stubbornest protection you can buy—makes these transformers corrosion-proof.

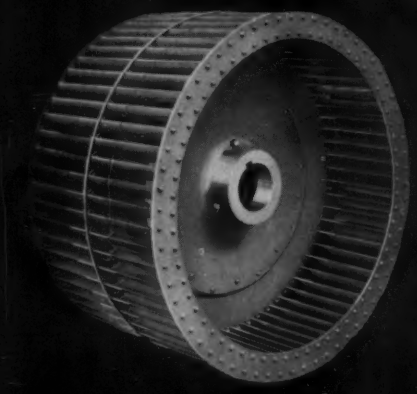
J-70794

YOU CAN BE SURE...IF IT'S

Westinghouse

Sam Waters, Westinghouse representative, demonstrates to Jack Evans, General Purchasing Agent, Ohio Edison, the volume of corrosive hardware removed from new line of Westinghouse transformers.

American Blower Fan Wheels



SIROCCO WHEELS

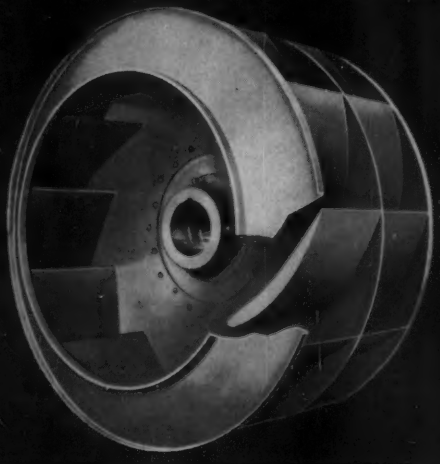
for forced and induced draft duty

- For balanced draft or pressurized furnace
- Low tip speed
- Die-formed, forwardly inclined blades and heavy streamline inlets
- Used in power plants the world over

AHS WHEELS

for forced and induced draft duty

- Backwardly inclined, nonoverloading horsepower characteristic
- For given duty operates at higher R.P.M.
- Single thickness flat or curved blade
- Heavy rolled streamline inlets

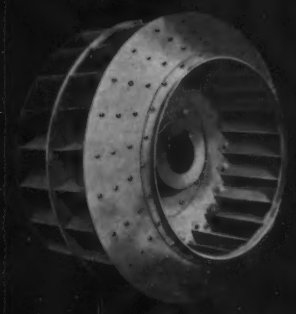


AIRFOIL BLADE WHEELS

primarily for forced draft duty

- Blades are of airfoil cross section, die formed and reinforced as required
- High mechanical and static efficiency
- Nonoverloading power characteristic
- Available with vanes and/or boxes

Meet Peak Efficiency Standards

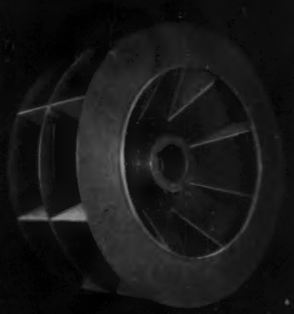


Radial tip blade wheel

RADIAL BLADE WHEELS

for forced, induced and gas recirculating duties

- Pressure characteristic favorable to gas recirculating application where unusual system pressures prevail
- Designed for severe temperature and pressure duty
- Available with straight radial or radial tip blades

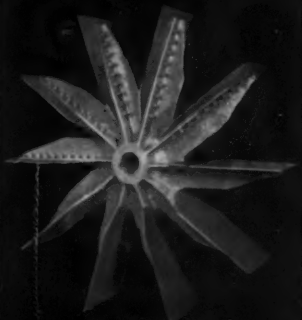


Straight radial blade wheel

Rim type wheel for primary air fans

SINGLE INLET RADIAL BLADE WHEELS FOR PRIMARY AIR, VENT, AND OVER FIRE DUTY

- Designed for high temperature, high pressure applications
- Radial or backwardly inclined blades, single inlet
- Over 1200 primary air fans in operation



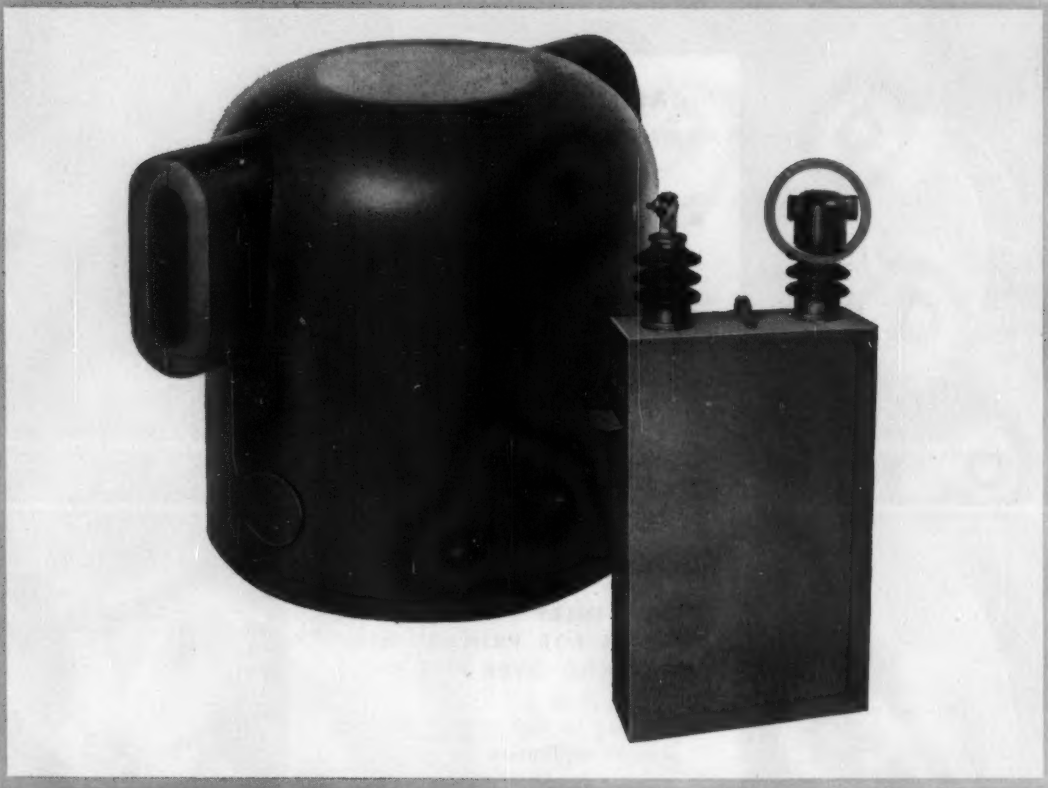
Rimless wheel for vent and over fire fans

IF YOUR plans include mechanical-draft equipment—for new installations or as replacements—consult your American Blower sales engineer. He can give you helpful information on job-fitted American Blower equipment to meet your power-plant requirements. Call our nearest branch office or write: American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ont.

AMERICAN BLOWER

Division of AMERICAN-Standard

Capacitor progress starts with TOBE



TOBE ENGINEERS KNOW that progress means not only monumental changes, but small improvements that can make a big difference in the daily operation of a utility.

For example: look at the self-locking rubber insulator cap above! Small—but did you ever try to tape a connector while hanging from a safety belt? It's time-consuming and none too safe to say the least.

But slap this TOBE insulator* over the connector, pull it together: presto you have a safe, enduring shield, (exceedingly simple to take apart for service).

TOBE TEMPALL CAPACITORS *also feature:*

- Special clamp arrangement with vibration-proof nylon-insert stop-nut on line hardware;
- Stainless steel case at no extra cost;
- Individual control of every capacitor during every step of assembly and impregnation;
- Discharge resistors across each series group;
- Thanks to TOBE'S advanced techniques, losses are consistently lower than requirements. You get more correction for every dollar.

Investigate TOBE capacitors today. Available in all standard ratings: in single units, racks, pole assemblies ready for field installation and energization.

Write to Tobe Deutschmann, Norwood, Mass. or phone Norwood 7-2620 collect for further information today.

LOOK TO TOBE FOR PROGRESS

Since 1929 persistent research, trustworthy engineering, rigid production standards.

TOBE

TEMPALL CAPACITORS

*PATENT PENDING

The linking of these two famous symbols...

means Better Service

for users of treated wood!

TIES
BRIDGE TIES
POLES
CROSS ARMS
PILES
TIMBER

The American Creosoting Corporation, a pioneer in the development of the wood preserving industry has joined forces with Union Bag-Camp Paper Corporation—one of the nation's most progressive manufacturers of products from wood.

As a result, AMCRECO'S technical skill and experience, developed through half a century of serving the largest users of treated wood, is now reinforced by Union-Camp's resources.

Convenient plant locations, extensive resources and experienced personnel have been teamed to provide you with a new standard of service and dependability. This will be reflected in modernized facilities, improved deliveries (from stock in many cases) and careful attention to your specifie requirements.

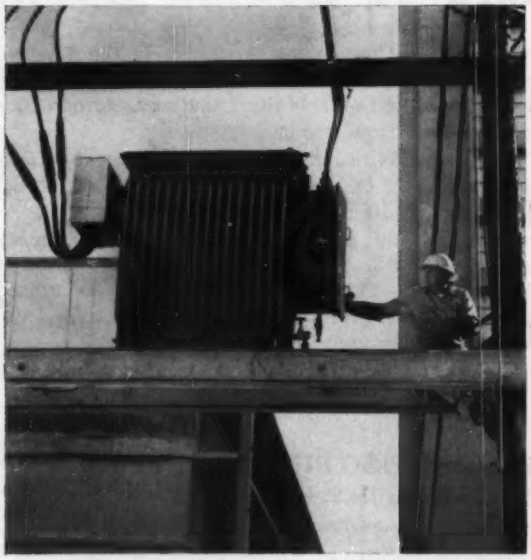
Let us show you how this new organization can be of help to you.

Time is Our Best Testimonial

AMERICAN CREOSOTING CORPORATION
Louisville 2, Kentucky
18 Strategically Located Treating Plants to Serve You

Subsidiary of
UNION BAG-CAMP PAPER CORPORATION

571

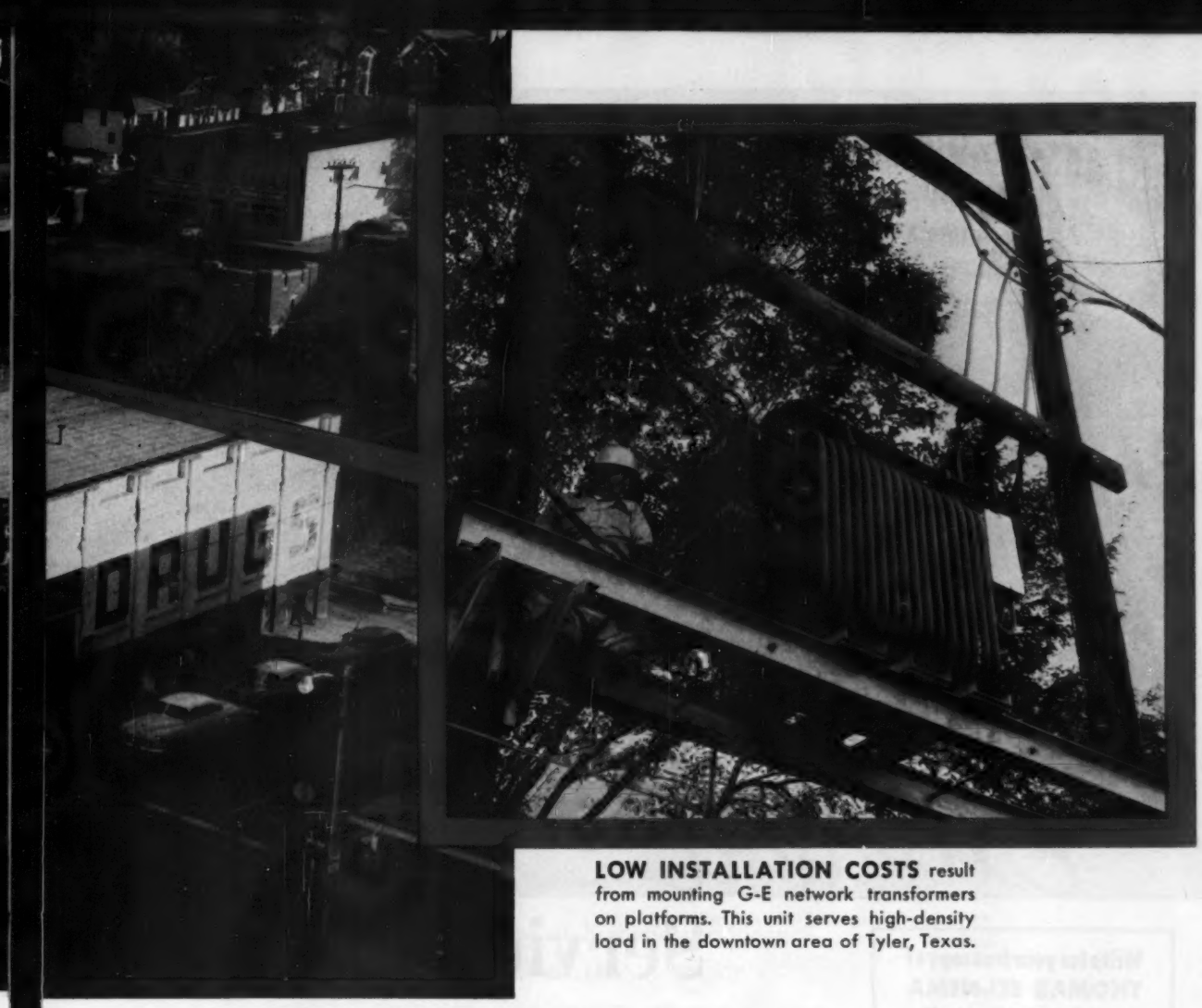


SPANNING ALLEY, this G-E platform-mounted network transformer is close to load, yet out of the way. When necessary, servicing the unit is quick and easy.

Network system

Texas Power & Light Company uses platform mounting for transformers to meet rapidly expanding loads

Rapidly expanding commercial loads will soon outgrow Texas Power and Light's radial system in downtown Tyler, Texas. The utility, therefore, is installing a number of General Electric network transformers on the present system to help carry the load. Quickly and easily serviced, the transformers and the platforms are installed convenient to the load—behind buildings, over alleys, in back yards.



LOW INSTALLATION COSTS result from mounting G-E network transformers on platforms. This unit serves high-density load in the downtown area of Tyler, Texas.

for tomorrow goes up in the air today

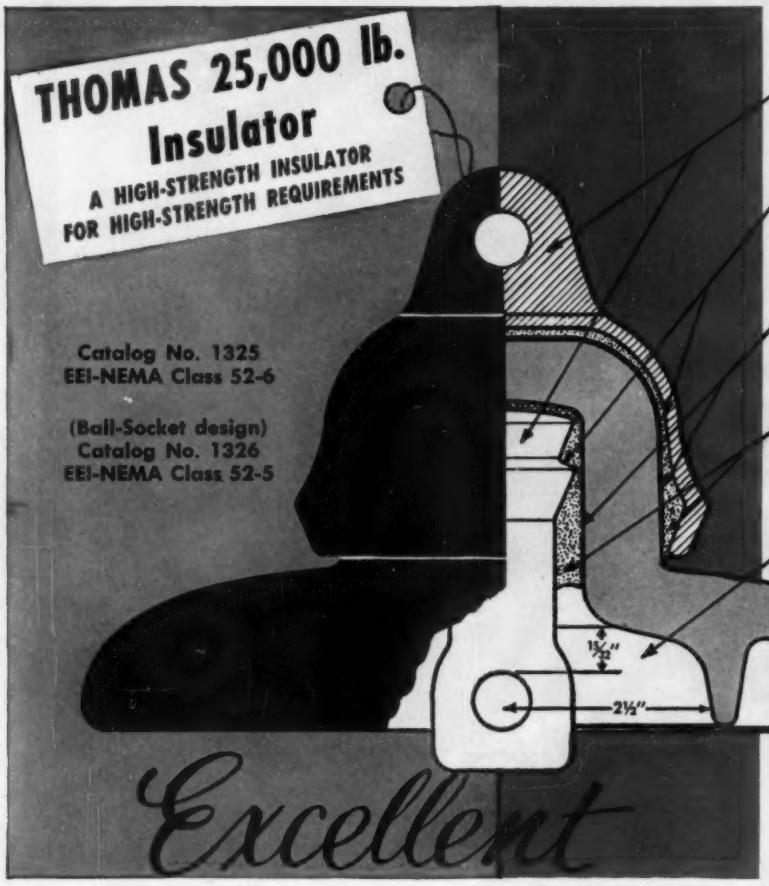
EASY TO CONVERT TO NETWORK SYSTEM. Texas Power and Light plans to convert its radial system eventually to an overhead secondary network system. Conversion cost will be low since the network transformers are already installed and cabling will be the same. Only network protectors must be added to the system, now protected by fused aerial cable.

HELP FOR YOU. Plan *now* to meet tomorrow's load growth problems. Remember, it costs less in the long run to increase capacity by changing to a network than by expanding a radial system—and the sooner you start, the less it will cost you. Your nearest G-E Apparatus Sales Office will be glad to help you draw up a future network system. Or write for Bulletin GEA-2432, General Electric Co. Section 431-61, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

Progress Is Our Most Important Product

GENERAL ELECTRIC


THOMAS 25,000 lb.
Insulator
A HIGH-STRENGTH INSULATOR
FOR HIGH-STRENGTH REQUIREMENTS
Catalog No. 1325
EEI-NEMA Class 52-6
(Ball-Socket design)
Catalog No. 1326
EEI-NEMA Class 52-5
High-strength forged steel cap and stud, hot-dip galvanized.
Asphaltic compound treatment of metal and porcelain prevents destructive thermal activity and impact damage.
Special high-strength sanded surfaces provide positive gripping areas for cementing cap and stud to porcelain.
Special Insulator Cement — steam-set under mechanically controlled conditions of temperature and humidity.
Extra large clearance between porcelain and stud facilitates assembly or disassembly, attachment of clamps or fittings, hot-line work, cleaning, etc.
1 5/32"
2½"
Full droop of porcelain shell and depth of petticoats yield full-value leakage length and greater freedom from cascading arcs.
Excellent

Write for your free copy of
THOMAS EEI-NEMA Standards Bulletin

1873 THOMAS INSULATORS our 84th year RELIABILITY 1957

"Specify Thomas"—The Best by Line Test

Service Records

... beginning in 1920 attest to enviable performance records which now add up to an astounding *2 million service-years* for this "Thomas Quality" unit.

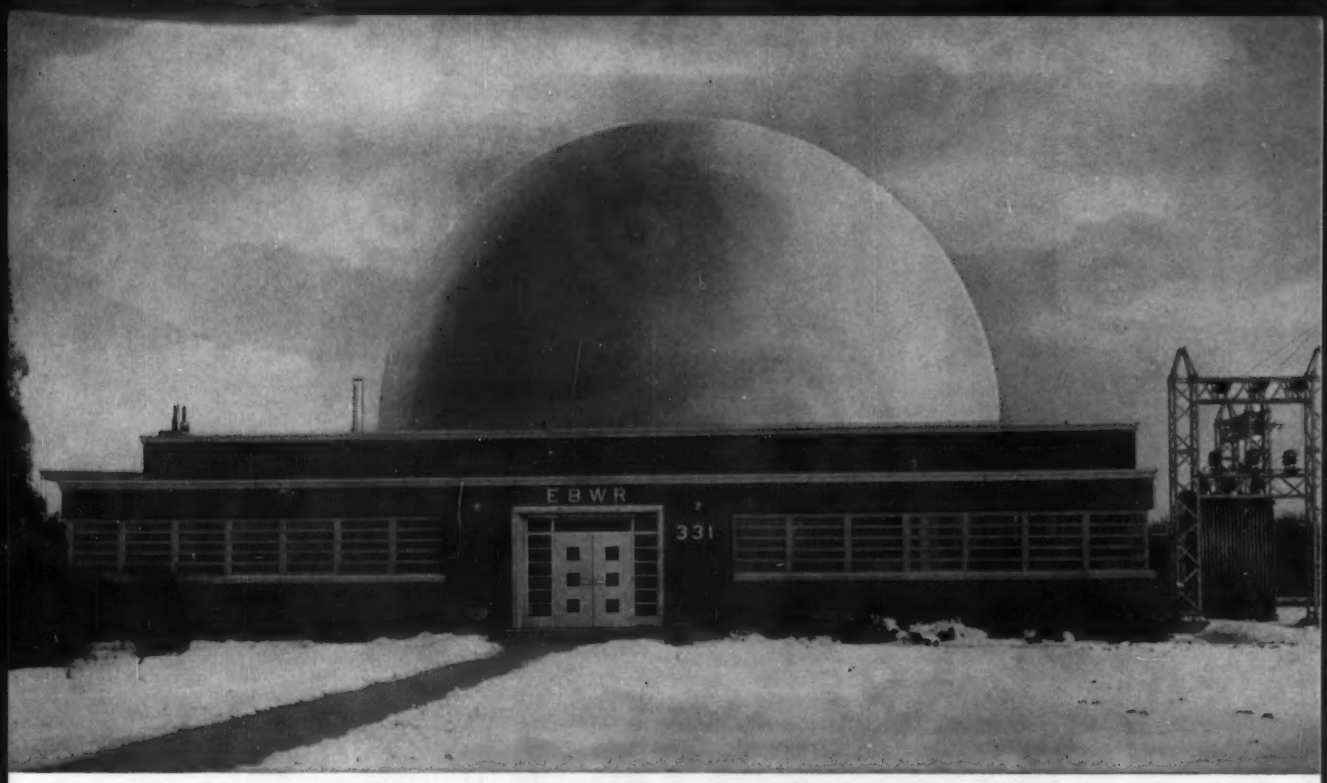
As the demand for higher strength insulators increases, Thomas offers this unit in both Clevis and Ball & Socket designs. Both incorporate all the latest improvements in quality manufacture and design plus an unexcelled, time-tested performance record. With the accent on quality you get a custom-built insulator for your most severe service ... there's a Performance-Proved difference.

The R. Thomas and Sons Co.

TX-52

Offices: CHICAGO NEW YORK — LISBON OHIO — SALES REPRESENTATIVES

C. G. Anderson, *Chicago* • E. B. Anderson Co., *Detroit* • Benson-Funk, Inc., *Boston* • Ken H. Best, *Seattle* • R. E. Cunningham & Son, *Los Angeles* • W. H. Eddy Electric Products, Inc., *Phoenix* • Electrical Distributors Co., *Philadelphia* • Engineer Sales Co., *St. Petersburg* • J. W. Fraser Co., *Charlotte* • Hamilton Associates, *Denver* • Geo. E. Honn Co., *San Francisco* • Hugo Sales Co., *Minneapolis* • Johansen Associates, *Lincoln* • J. O. Mann, *Pittsburgh* • Osgood Associates, *Atlanta* • John G. Pettyjohn Co., *Knoxville* • J. F. Schaefer & Co., *Kansas City* • M. H. Snyder & Sons Co., *New York City* • Southeastern Electric Supply Corp., *Richmond* • Triangle Electric Supply Co., *El Paso* • United Electric Supply Co., *Salt Lake City* • J. H. Warrington, *Lexington* • Williamson Sales Co., *Shreveport, Amarillo, Baton Rouge, Beaumont, Corpus Christi, Dallas, El Paso, Houston, Jackson, New Orleans, Pine Bluff, San Antonio, Tulsa*



EBWR

"Today marks an event of historic significance in man's development of the atom for peaceful purposes. The reactor we are placing in operation today is the first of a generation of such reactors designed to provide electric power for our factories and our homes, power upon which the strength and future well being of this country vitally depends."

from Dedication address, Feb. 9, 1957, by Rep. Carl T. Durham, Chairman, Joint Congressional Committee on Atomic Energy.

EXPERIMENTAL BOILING WATER REACTOR PLANT
Argonne National Laboratory
Lemont, Illinois

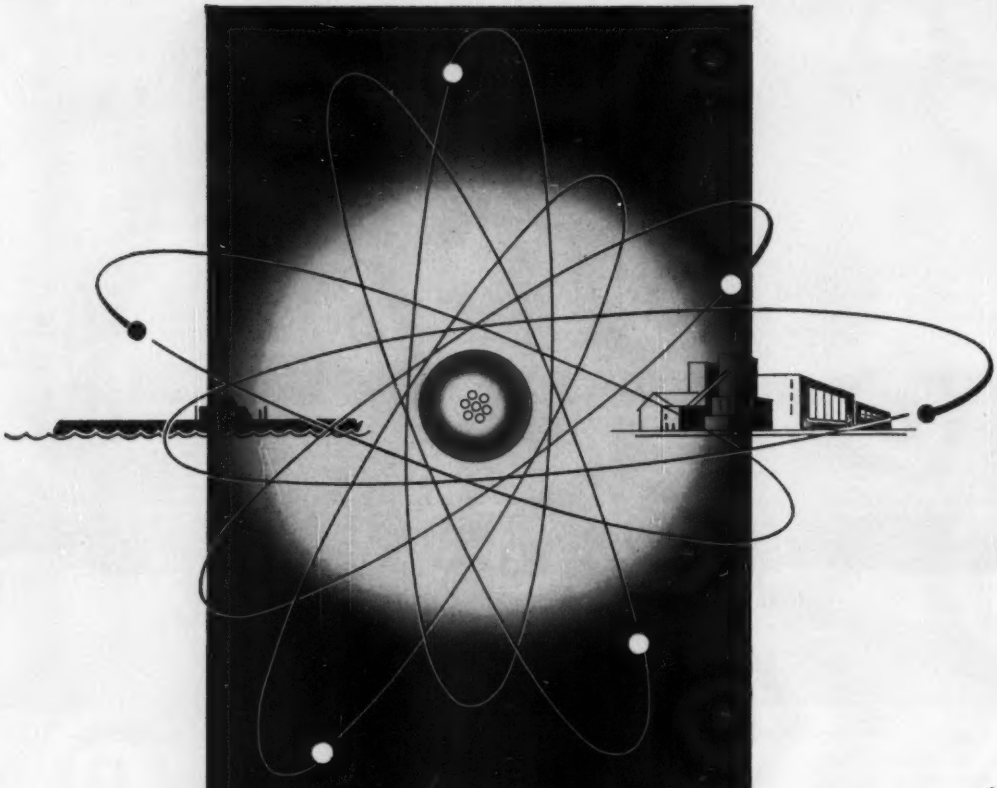
TURBINE RATING
5000 kw—600 psig—488° F

ENGINEERING AUTHORIZED
August 25, 1954

FULL POWER GENERATION
December 29, 1956

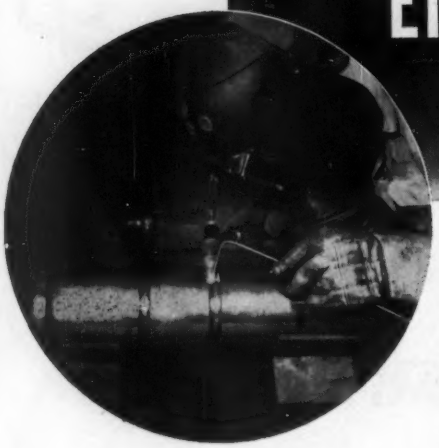
FORMAL DEDICATION
February 9, 1957

SARGENT & LUNDY ENGINEERS
140 SOUTH DEARBORN STREET, CHICAGO 3, ILLINOIS



pioneers in piping for

ATOMIC ENERGY



P. P. & E. produced the first piping installations for marine and stationary nuclear power plants. Our facilities are complete —metallurgical research, laboratory service, engineering, shop fabrication, testing, and field erection. We have fabricated stainless steel piping for power and process industries since the middle 1920's.

since 1903
fabricators of
power and process piping
for these industries . . .

Electric Generating
Paper and Pulp
Chemical Processing
Basic Metals
Food
Textiles
Transportation
Manufacturing
Ordnance
Refining

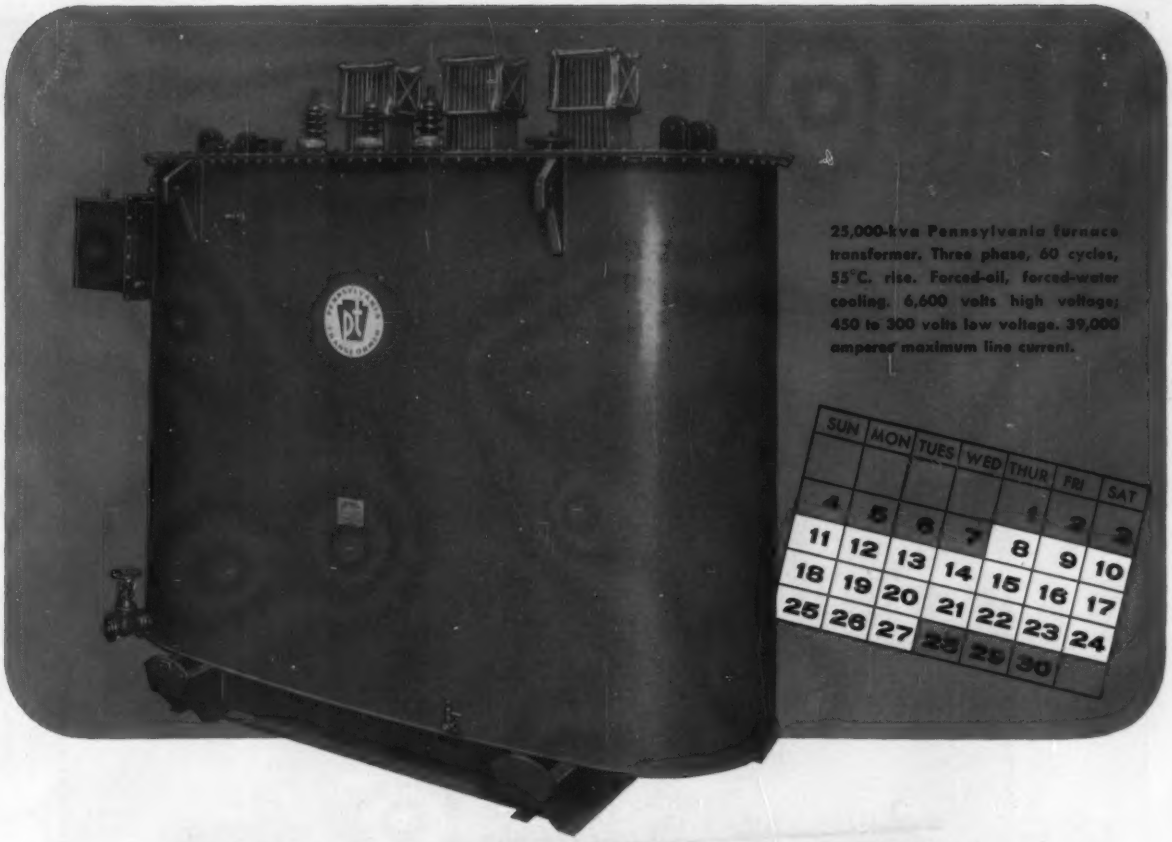
OFFICES IN PRINCIPAL CITIES

Atlanta .....Whitehead Building
Boston .....10 High Street
Chicago.....Peoples Gas Building
Cleveland.....Public Square Building
Hollywood....1828 North Alexandria Ave.
New Orleans .....P. O. Box 74
New York .....Woolworth Building
Syracuse .....113 So. Salina Street
Toronto.....68 Yonge Street

Pittsburgh Piping
AND EQUIPMENT COMPANY
158 49th Street — Pittsburgh, Penna.

CANADA: CANADIAN PITTSBURGH PIPING, LTD.
835 BEACH ROAD—HAMILTON, ONTARIO

FP-17


25,000-kva Pennsylvania furnace transformer. Three phase, 60 cycles, 55°C. rise. Forced-oil, forced-water cooling. 6,600 volts high voltage; 450 to 300 volts low voltage. 39,000 amperes maximum line current.
SUN MON TUES WED THUR FRI SAT
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30

BUILT and SHIPPED in *20 Calendar Days!*

25,000 KVA FURNACE TRANSFORMER

by Pennsylvania

Even the *promised* shipping date of four weeks looked like excellent service to the West Coast steelmaker — and yet Pennsylvania was able to cut the allotted production time by more than one-fourth! As a result, the electric steel furnace for which this 25,000-kva replacement unit was built was put back into service even sooner than expected, and several days of costly downtime were averted.

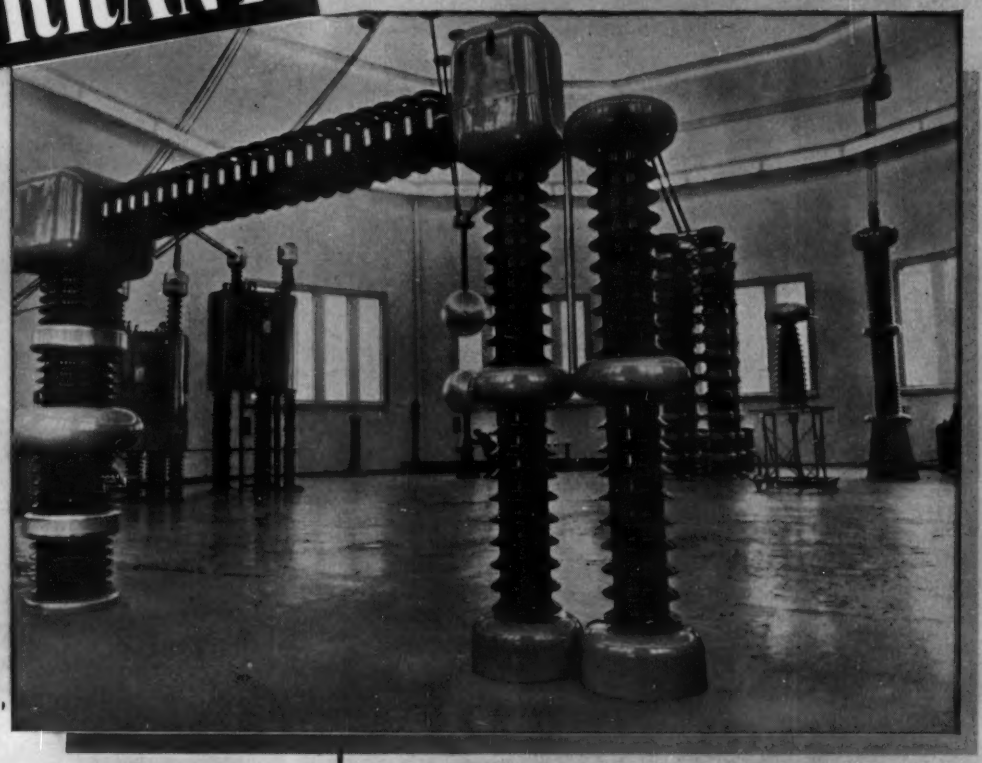
Throughout the years, Pennsylvania Transformer has established a nation-wide reputation for tackling — and solving — the most difficult transformer problems, whether they involve short-time delivery or special design requirements. Particularly in the highly demanding furnace transformer field has this been true. Only recently Pennsylvania designed and built a record-breaking 82,000-ampere unit . . . and more than once have furnace transformers with special requirements been designed, built and shipped in less than two months.

Of course it takes a lot of "everyday" know-how to accomplish the unusual, and Pennsylvania has designed and built virtually every size and type of furnace transformer now in use: from 250 through 25,000 kva, and from 3175 through 82,000 amperes. Why not put this furnace transformer experience to work for you? Pennsylvania Transformer Company, A McGraw-Edison Company Division, Canonsburg, Pa.

PENNSYLVANIA PENNSYLVANIA TRANSFORMER **FURNACE TRANSFORMERS**

FERRANTI

HIGH VOLTAGE TESTING EQUIPMENT



IN NORWAY

The Testing Equipment illustrated has been supplied by Ferranti Ltd. to the Research Laboratory of Standard Telefon og Kabelfabrik A/S, Oslo, Norway. It consists of :

Foreground : 1,000,000 volt D.C. Testing Equipment.

Left . 600 kV, 1,200 kVA , A.C. Testing Equipment.

Background : 12 Stage 2,000,000 volt Impulse Generator.

A 1,500 mm sphere gap and surge potentiometer can also be seen in the background.

TRANSFORMER CAPACITY OF OVER 5,000,000 kVA PER ANNUM

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

FERRANTI LTD. Head Office and Plant : HOLLINWOOD · LANCASHIRE · ENGLAND

PLANTS AND OFFICES

NEW YORK : Ferranti Electric Inc., 30 Rockefeller Plaza, New York 20, N.Y.

TORONTO : Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario.

MANCHESTER, ENGLAND : Ferranti Ltd. Moston, Manchester 10.

EDINBURGH, SCOTLAND : Ferranti Ltd., Ferry Road, Edinburgh 5.

Hotpoint congratulates the winners of the George A. Hughes Awards for 1956

DIVISION A—OVER 250,000 METERS

Electric Range Activity
Southern California Edison Co.
Los Angeles, California

Electric Water Heater Activity
Florida Power & Light Co.
Miami, Florida

Commercial Electric Cooking Activity
Georgia Power Co.
Atlanta, Georgia

DIVISION B—UNDER 250,000 METERS

Electric Range Activity
Florida Power Corp.
St. Petersburg, Florida

Commercial Electric Cooking Activity
Washington Water Power Co.
Spokane, Washington

Hotpoint is happy to join the Electric Industry in congratulating these electric utility companies for their outstanding accomplishments in 1956.

Through their efforts in successfully promoting the use of major electrical appliances, they have earned the distinction of leadership. More *salespower* has been put into "HOUSEPOWER"—more *living* in "LIVE BETTER . . . Electrically". And in so doing, they have brought greater comfort and convenience to their customers.

Hotpoint is proud to salute these progressive utility companies, and their employees—the winners of the George A. Hughes Awards for 1956.

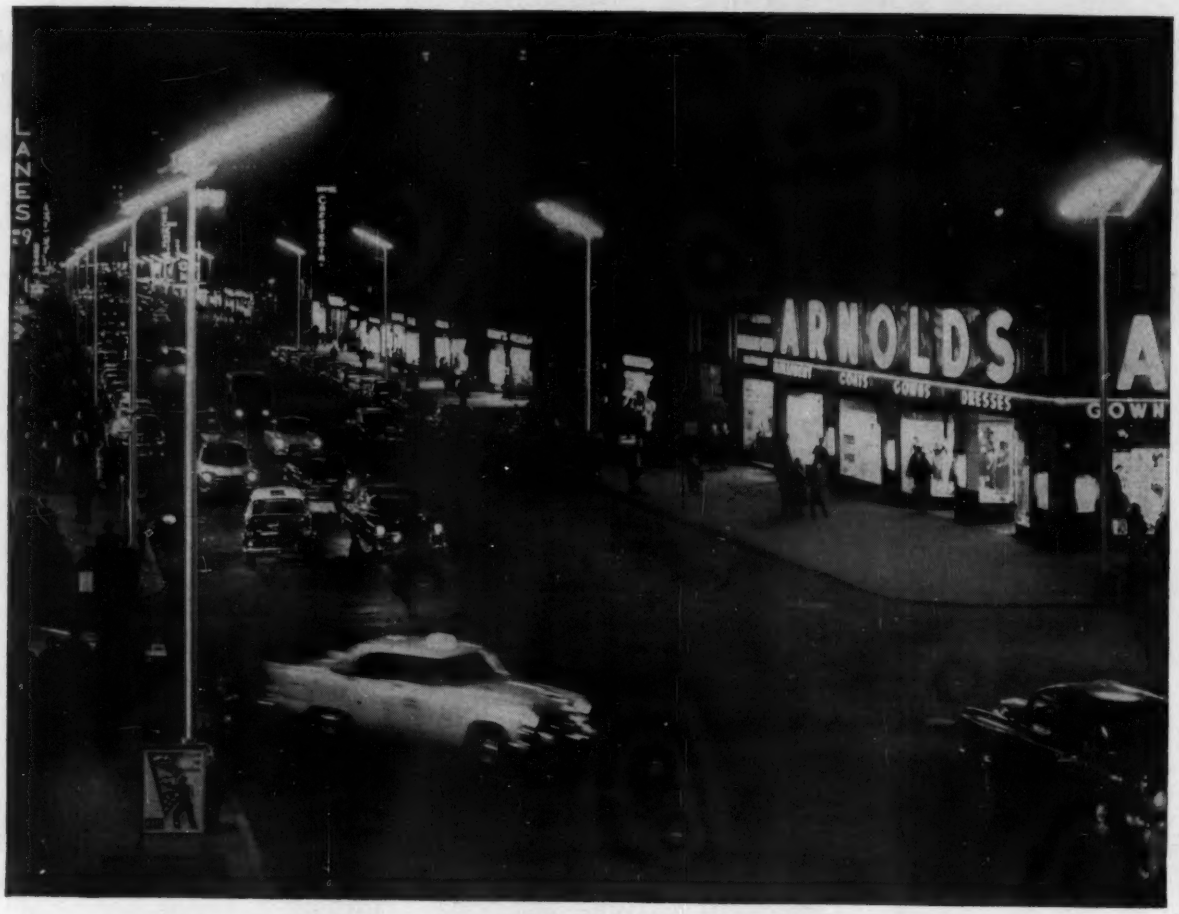
Plan now to enter the 1957 competitions. Watch for details to be announced soon.

LIVE BETTER ELECTRICALLY

Again, Hotpoint *looks at Tomorrow, Today!*

RANGES • REFRIGERATORS • AUTOMATIC WASHERS • CLOTHES DRYERS • DISHWASHERS • DISPOSALLS®
WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • CUSTOMLINE • TELEVISION

HOTPOINT CO. *(A Division of General Electric Company)*
5600 West Taylor Street, Chicago 44, Illinois



New York City's "14th Street Association" proves modern whiteway lighting pays big dividends

With the use of P & K aluminum standards and LUXaire® Fluorescent Luminaires, the average light level on 14th Street, a major downtown shopping center, has been increased from 0.4 to better than 2 foot candles. The P & K LUXaire® units, specially designed in wedge shape, are mounted at 30-foot height on staggered 70-foot spacings.

The choice of P & K equipment, combining high strength with light weight, permitted the use of existing electrical vaults with a minimum of excavation and foundation work. Installation was quick, easy, and low in cost. Negligible maintenance requirements, a feature of all P & K products, will serve to keep the *real* cost of lighting equipment on 14th Street surprisingly low.

Comments from the 14TH STREET ASSOCIATION, who paid for the new lighting: "New White way has accomplished its purpose . . business improvement . . enhanced shopping area . safer for shoppers and vehicular traffic. . . ."

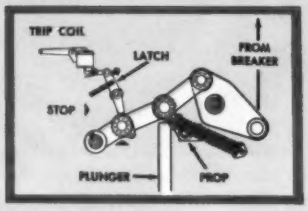
WRITE FOR A COPY OF THE P & K LUXaire® Catalog . . . and use the P & K planning and advisory services without obligation.

P&K

PFAFF & KENDALL

84 FOUNDRY ST., NEWARK 5, N. J.

Mechanically trip-free operation of this Pneu-Draulic operated breaker means positive protection



Since 1933—

Allis-Chalmers has built all power breakers mechanically trip-free. Only in mechanically trip-free breakers are contacts and closing mechanism completely uncoupled during tripping operation . . . enabling contacts to open at full rated speed without restriction from mechanism.

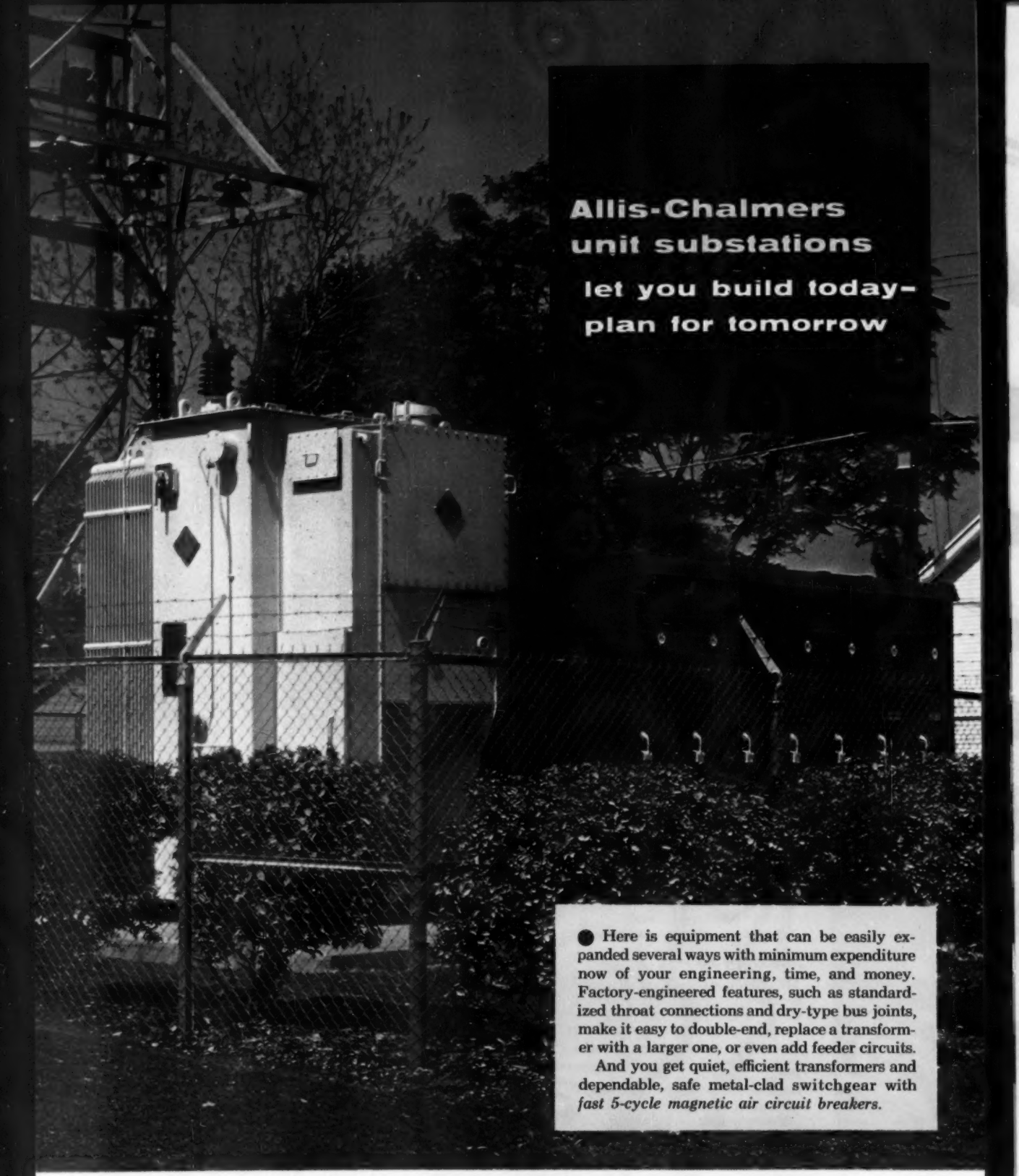
Breakers that are only pneumatically or hydraulically trip-free can't give you this protection.

Pneu-Draulic is an Allis-Chalmers trademark.

For details of this and other features of Allis-Chalmers power oil circuit breakers, call your nearby A-C office, or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-5241

ALLIS-CHALMERS



Allis-Chalmers unit substations let you build today– plan for tomorrow

● Here is equipment that can be easily expanded several ways with minimum expenditure now of your engineering, time, and money. Factory-engineered features, such as standardized throat connections and dry-type bus joints, make it easy to double-end, replace a transformer with a larger one, or even add feeder circuits.

And you get quiet, efficient transformers and dependable, safe metal-clad switchgear with *fast 5-cycle magnetic air circuit breakers.*

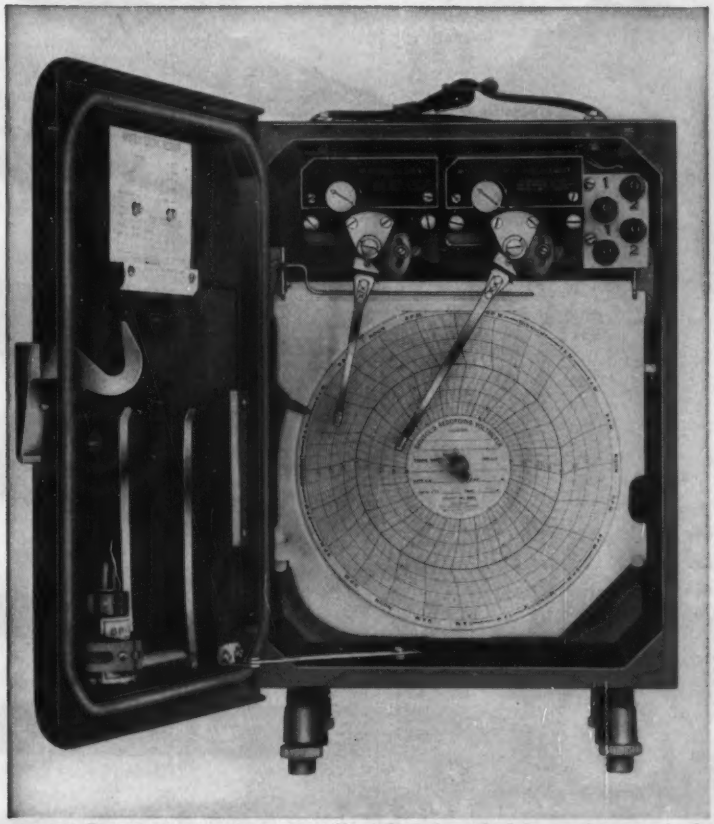
A-5246

For help on your substation problems, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

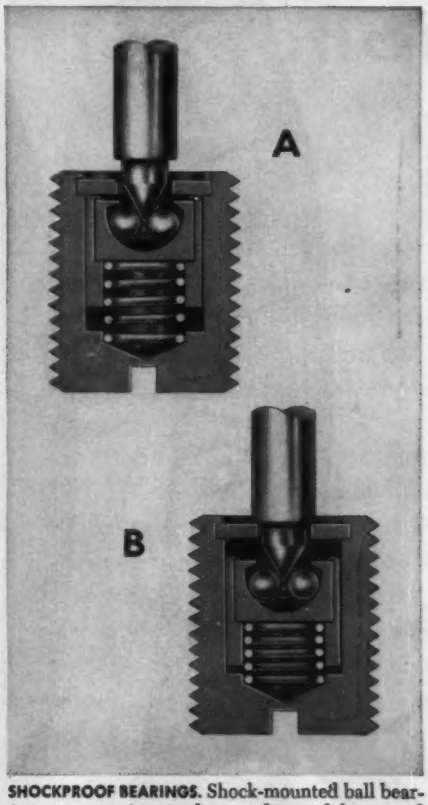
ALLIS-CHALMERS *for progress in switchgear*

New! Two-pen Voltmeter

Two rugged reliable moving-iron elements provide independent records to ±1% on single chart: Similar two-pen ammeter available



BRISTOL'S® TWO-PEN VOLTMETER. Portable (*shown*) is ideal for on-the-spot checks requiring two simultaneous voltage records. Also available for portable and pole mounting use and for permanent installations.



SHOCKPROOF BEARINGS. Shock-mounted ball bearings support pivots at front and rear of the rugged moving-iron measuring element. In normal use (A) spring holds bearings against pivot. Under mechanical shock (B) spring absorbs impact.

Here's the ideal instrument for on-the-spot simultaneous records of two a-c voltages—either related or independent.

Bristol's new two-pen voltmeter has the same rugged moving-iron measuring elements as Bristol's standard electrical instruments. But there are *two* elements with *two* pens, providing *two* independent records on a two-zone chart!

The new voltmeter provides easy-to-read visual records and is valuable for such uses as checking the balance on single-phase three-wire systems and for visualizing voltage regulation. Available for portable, portable and pole mounting or for wall, switchboard, or flush-panel mounting. Two-pen ammeter model is ideal for portable use with split-core current transformers.

Here are some outstanding features of this new Bristol instrument:

High accuracy—±1% of full scale.

Two high-torque moving-iron mechanisms—Bristol's moving-iron mechanism produces greatest torque possible while keeping weight and power drain to a minimum. Assures positive recording over full range.

Low electrical burden—Only 5.5 volt-amperes at 120 volts or 12 volt-amperes at 240 volts for each voltmeter mechanism. Only 5 volt-amperes at 5 or 10 amps for ammeter.

High stability of calibration—Bristol's moving-iron mechanism is inherently stable, seldom requires calibration.

Easy calibration in field—Recalibration, if necessary, is easily accomplished by user without special tools or skills.

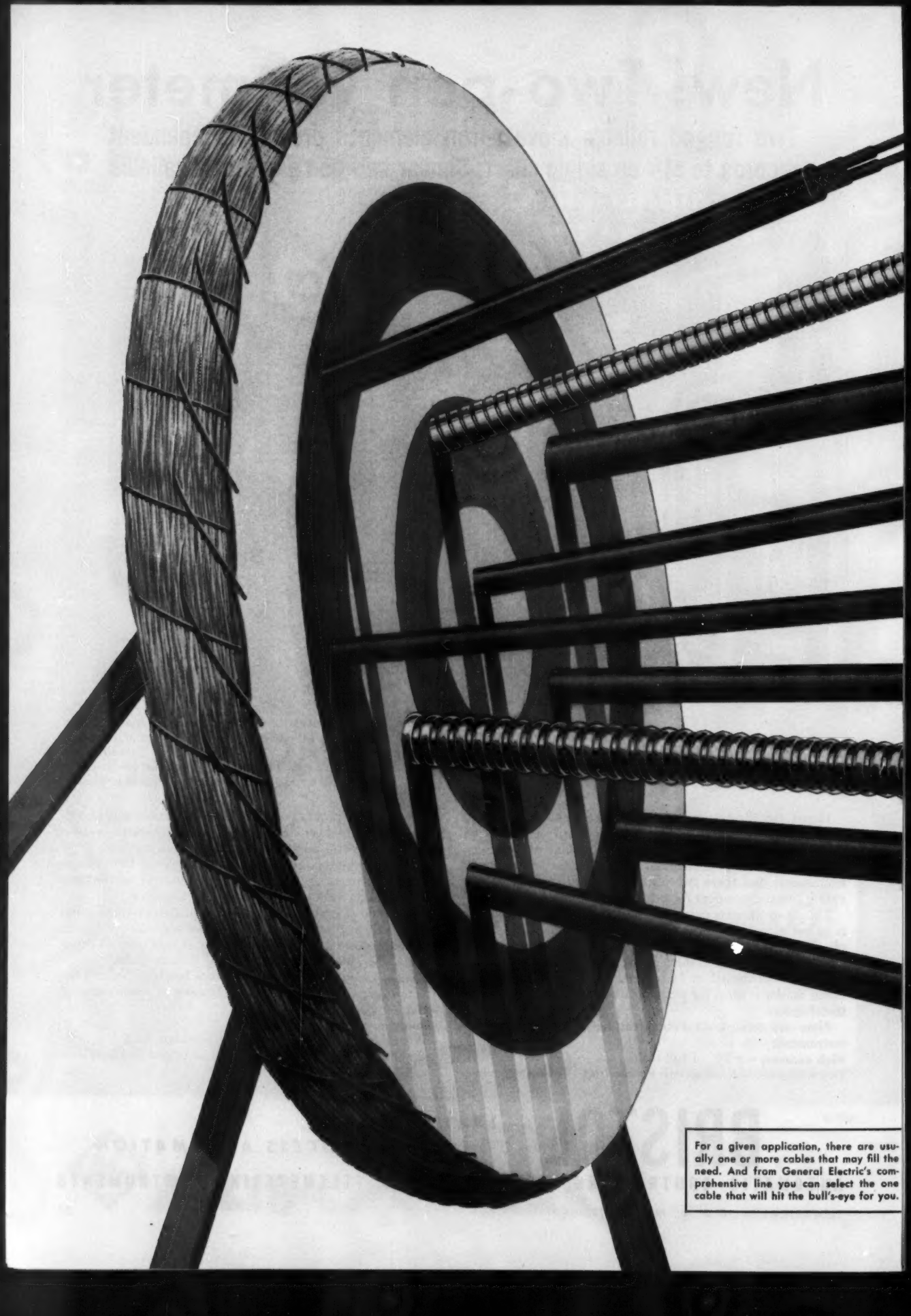
Rugged construction includes shockproof bearings, locking device to prevent pen movement in shipping or while carrying portable models.

Leveling not critical.

Write for complete data on this outstanding recording voltmeter today. The Bristol Company, 116 Bristol Road, Waterbury 20, Connecticut. 6.27

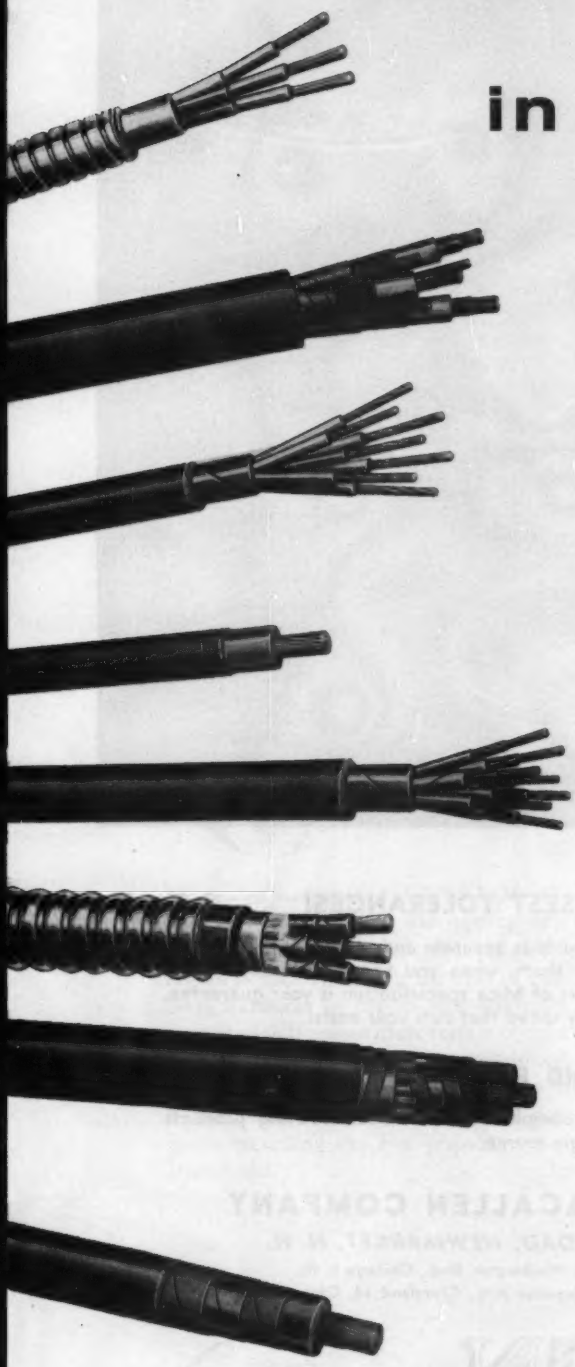
BRISTOL *TRAIL-BLAZERS IN PROCESS AUTOMATION*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



For a given application, there are usually one or more cables that may fill the need. And from General Electric's comprehensive line you can select the one cable that will hit the bull's-eye for you.

The importance of accuracy in cable selection



Today, selection of the best wires and cables for your particular needs demands that a wide variety of factors be considered, ranging from standard requirements such as flame-resistance, heat-, moisture-, and weather-resistance—to special constructions which withstand vibration, the electromagnetic effects of adjacent power cables—even the effects of atomic radiation.

General Electric has developed hundreds of cables for just about every possible application. Thus, General Electric engineers are never limited to one wire or cable for a given job but can suggest the most efficient and economical solution for the particular situation.

This is one of the important reasons why many electric utilities and industrial plants work with General Electric wire and cable engineers in planning their electrical expansion and modernization programs. Another reason is General Electric's knowledge of the requirements of other basic components of power distribution systems—transformers, load centers, switchgear, etc.—the knowledge that the right cable plays an important part in satisfactory system performance.

All this adds up to experience that can benefit you. Take advantage of it the next time you have a cable selection problem. For information on your specific wire and cable application or selection problem, see the G-E wire and cable specialist in your locality or write Section W197-527, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

LIVE BETTER ELECTRICALLY

Progress Is Our Most Important Product

GENERAL ELECTRIC

CLOSEST TOLERANCES!

You get insulating parts as accurate and as uniform as men and machines can make them, when you specify Macallen Mica. More than sixty years of Mica specialization is your guarantee. The result? Assembly speed that cuts your costs!

SEND FOR CATALOG!

It covers the most complete line of mica insulating products available from a single source.

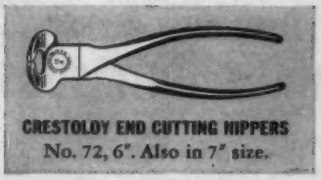
THE MACALLEN COMPANY

BAY ROAD, NEWMARKET, N. H.

565 W. Washington Blvd., Chicago 6, Ill.
1231 Superior Ave., Cleveland 14, Ohio

SPECIFY **MACALLEN MICA**

FOR THE MOST IN MICA



CRESTOLOY END CUTTING NIPPERS
No. 72, 6". Also in 7" size.

Each and every

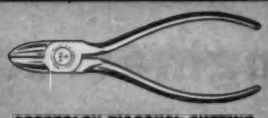
CRESTOLOY PLIER *is*

individually tested!

CRESTOLOY HEAVY DIAGONAL CUTTING PLIERS
No. 542, 7" size only.

CRESTOLOY LONG NOSE SIDE CUTTING PLIERS
No. 654, 6". Also in 7" size.

CRESTOLOY LINEMENS' SIDE CUTTING PLIERS
No. 1950, 8". Also in 6" and 7" sizes.



CRESTOLOY DIAGONAL CUTTING PLIERS
No. 942, 6". Also in 4" and 5" sizes.

When you choose a CRESTOLOY PLIER you know you are getting top value and proven performance. After rigorous factory testing for ease of cutting, hardness of blades and strength, each tool that passes these tests is tagged with the certifying tag reproduced above. CRESTOLOY PLIERS are available in more than a score of patterns including the five popular types illustrated.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

PRIMARY UNIT SUBSTATIONS

CUSTOM BUILT FOR YOU —AT NO EXTRA COST

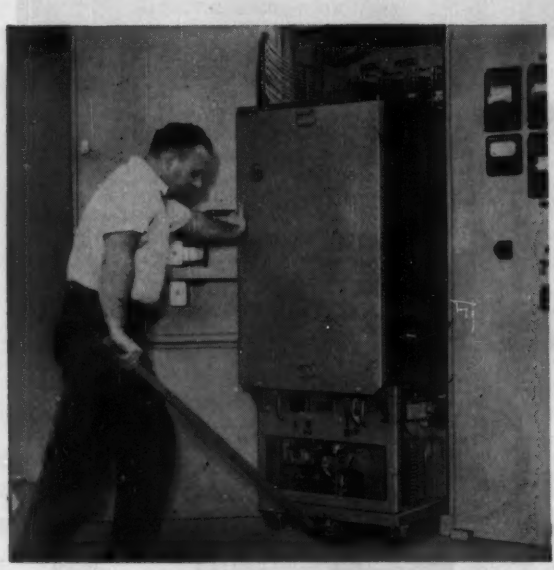
Here at I-T-E, complete primary unit substations are custom designed and engineered to meet your particular requirements. I-T-E engineers skillfully knit together quality I-T-E substation components in a way to give you the advantages of versatility, reliability, safety and convenience.

Particular emphasis is placed on ease of installation to meet all your requirements for growth and relocation, with full regard to an appearance that fits well into your surroundings.

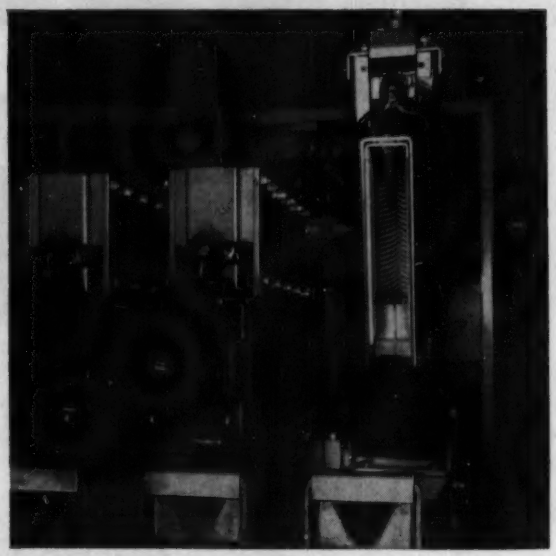
Typical I-T-E quality manufacturing standards further insure that your substation will give you the maximum reliability and performance at the lowest cost. Delivery can be made in accordance with your own construction schedule. You can save time, trouble and money in completing the final job.

I-T-E primary unit substations are available for any application and in any standard rating. For details, call the I-T-E sales office near you. Or write I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.

Engineered to insure the best value

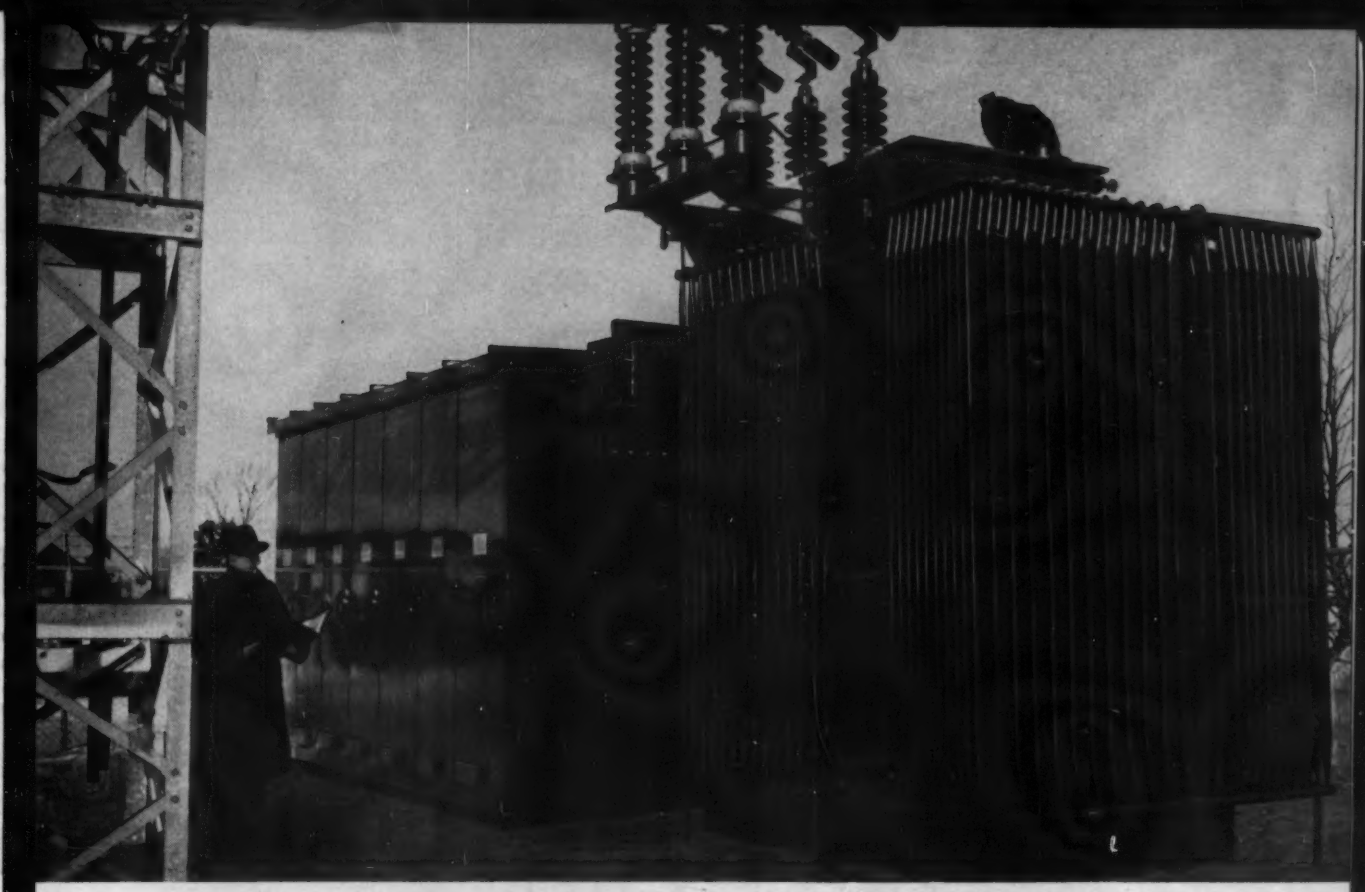


Horizontal drawout air circuit breakers. Even heavy 13.8-kv circuit breakers roll out easily on permanently attached wheels. Safety shutters automatically close over bus openings when breaker is moved to test position or from enclosure.

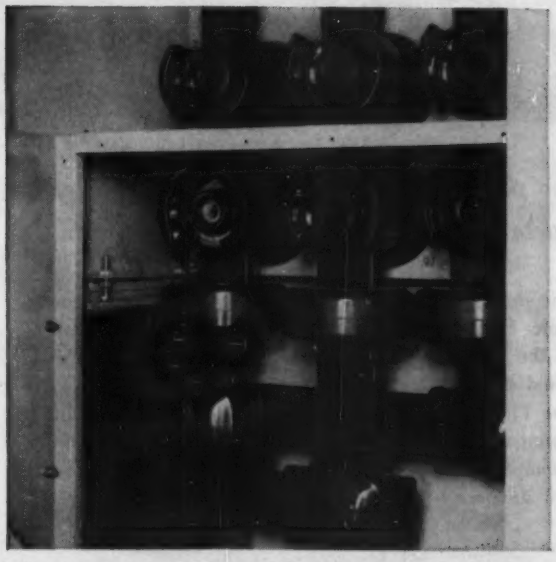


Positive arc interruption. Double coil, closed iron magnetic circuit produces intense magnetic effect, drives arc rapidly and uniformly between plates in arc chute, where it is extinguished, giving faster interruption, longer arc chute life.

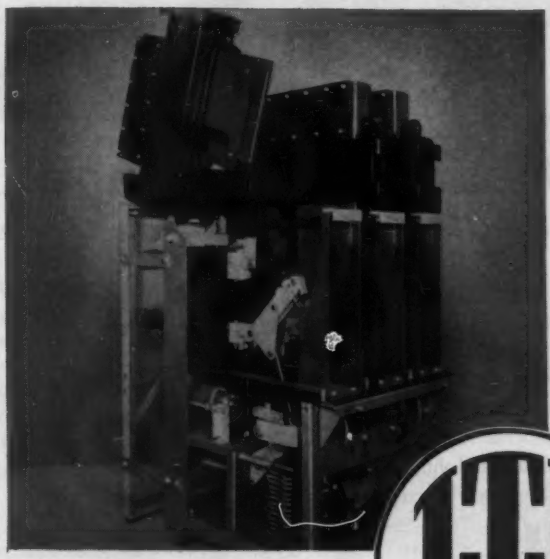
I-T-E CIRCUIT BREAKER COMPANY—Switchgear Division



and the most reliable performance

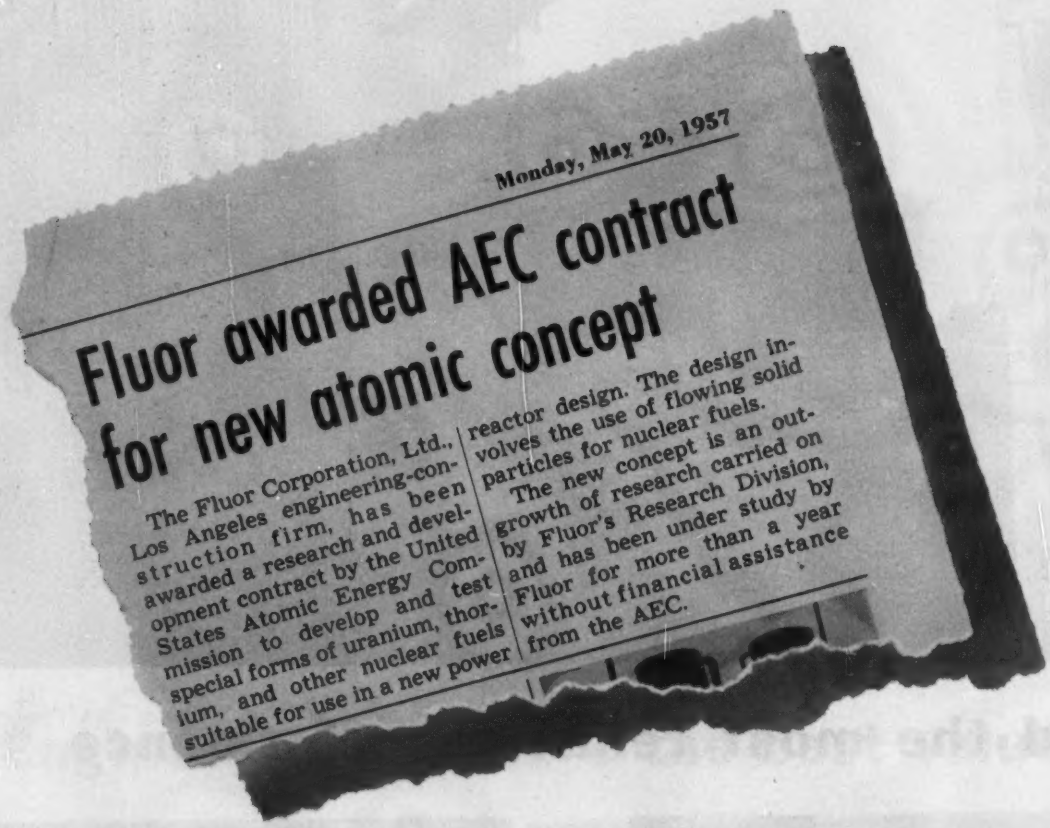


Fully isolated main bus with flame-retardant insulation. Bus is held in alignment against short circuit stress by porcelain bus supports. Flame-retardant insulation covers entire bus, including porcelain primary disconnect housings.



Simplified maintenance. Pivoting arc chutes simplify routine inspection and upkeep. Auxiliary devices are positioned to permit easy access.

I-T-E


Monday, May 20, 1957
Fluor awarded AEC contract for new atomic concept
The Fluor Corporation, Ltd., Los Angeles engineering-construction firm, has been awarded a research and development contract by the United States Atomic Energy Commission to develop and test special forms of uranium, thorium, and other nuclear fuels suitable for use in a new power reactor design. The design involves the use of flowing solid particles for nuclear fuels. The new concept is an outgrowth of research carried on by Fluor's Research Division, and has been under study by Fluor for more than a year without financial assistance from the AEC.

Creative Challenge: *A new power reactor system offering greater economy, higher operating temperatures, lower reactor pressures, and reduced corrosion.*

In August 1955 a concept of using flowing solid particles for nuclear fuels was originated by a group of Fluor engineers.

Upon receiving a preliminary findings report, Fluor management, convinced of the importance of the proposed process, initiated a full scale, company sponsored study of the process. A patent application was filed by M. R. Dusbabek and F. L. Johns, engineers responsible for project. Over five months of developmental tests and studies followed.

The findings of the Fluor studies were offered to the Atomic Energy Commission for evaluation. In March 1957 the AEC awarded a contract to Fluor based on the original studies.

The Fluor Corporation, Ltd. is particularly proud of this contract because it represents a Fluor ideal . . . *creative imagination coupled with scientific ability holds the key to America's industrial future.*

FLUOR *ENGINEERS AND CONSTRUCTORS for the Petroleum, Chemical and Power Industries*

The FLUOR CORPORATION, Ltd., Los Angeles – Mid-Continent Division, Houston – Research Division, Whittier, California – Fluor of Canada, Ltd., Toronto – Singmaster & Breyer, Inc., New York City

UTILITIES EXPECT MORE FROM POWERS *American*

Series 350
SERVICE-MAINTENANCE BODY
HANDLES 3 JOBS

Series 450
MAINTENANCE AND CONSTRUCTION BODY
Another unique design, ideal for municipalities!

DUAL PERFORMANCE...

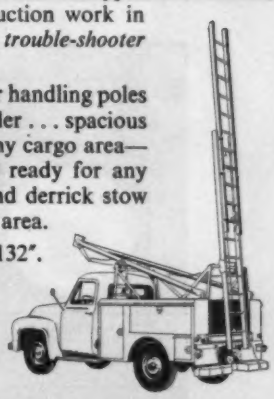
- Revolving aerial ladder for overhead work—revolves 360°—furnished in a height best suited to your needs.
- Underslung winch permits use of derrick—for handling 35′ poles—without interference to aerial ladder.

The Series 450 is available in 108″ and 132″ length.

This extremely versatile body will handle all types of service, maintenance, and construction work in small operations . . . and is an ideal *trouble-shooter* for larger utilites.

An easily-erected fold-over derrick for handling poles up to 35′ . . . a 24′ extension ladder . . . spacious bin-equipped compartments . . . roomy cargo area—all combine to make the Series 350 ready for any job at a moment's notice. Ladder and derrick stow above body . . . never obstruct cargo area.

In four lengths—84″, 90″, 104″, and 132″.

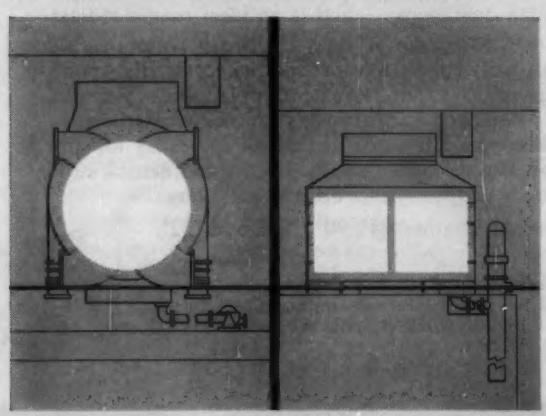


Get complete details and price information. Send for Powers-American Series 350 Bulletin #109R or Series 450 Bulletin #118 *today*.

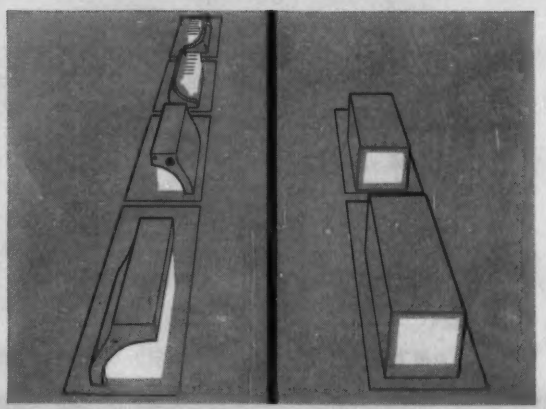
McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY · ST. LOUIS 15, MO. • 625 CEDAR ST. · BERKELEY 10, CALIF.

WESTINGHOUSE RECTANGULAR



Waste no space! Rectangular condensers require less headroom, fully utilize all space under turbine.



Faster installation! Rectangular condensers can be shipped in "bigger chunks" . . . less field welding.

CONDENSERS ...another great timesaver for station erection schedules

SAVE TIME—Basic simplicity of rectangular condenser design makes it possible to ship "bigger chunks of capacity." Building-block assembly speeds rigging; field welding is drastically cut. With its flat base, it is quickly and easily leveled. Westinghouse rectangular condensers can get you on the line faster.

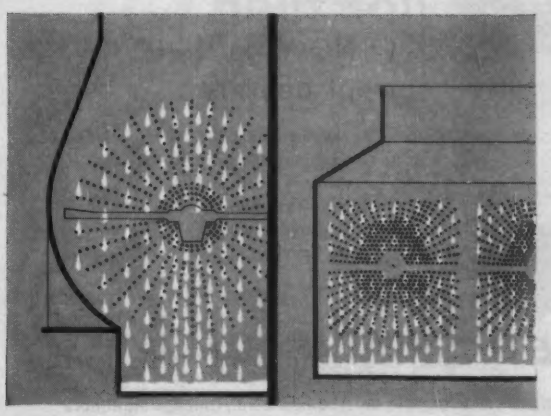
SAVE SPACE—As station ratings go higher and higher, equipment gets bigger. That's when space utilization takes on increasing importance. Westinghouse rectangular condenser design uses *all* the space under the turbine—*wastes none.*

BOOST EFFICIENCY—Two things, above all, you want from a condenser: Lowest possible absolute pressure, maximum reheating and deaeration of condensate. With its two-compartment radial-flow design and consequent short steam path to center air offtakes, a rectangular condenser provides lowest pressure drop. Uniform fall of condensate and the counterflow of steam from the lower steam belt liberate oxygen and assure deaerated condensate at saturation temperature.

Get the full story on Westinghouse condensers, circulating pumps, condensate pumps and air ejectors from your Westinghouse representative; or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60595

YOU CAN BE SURE...IF IT'S

Westinghouse



Boost efficiency! Lowest pressure with maximum reheat; condensate falls uniformly through belt of steam.

up to 20 TIMES more POWERFUL

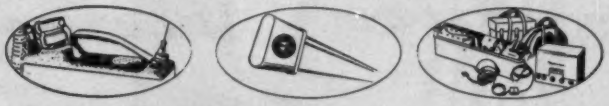
. . . rugged new TRANSISTORIZED design

much greater operating range . . . now you can have the greatly extended coverage and clearer messages you've always wanted. These new HANDIE-TALKIE portable radiophones are by far the *most powerful* portables ever built!

much smaller, much lighter . . . new circuits, transistors and subminiature components make them as much as 50% smaller and lighter—truly *portable* and easy to handle for hours without fatigue. The dry battery pack model weighs only an ounce over 7½ lbs.

much lower operating cost . . . dry battery replacement costs have been cut as much as 67%! With adaptor, rechargeable wet cell models can be operated from a car's 6 or 12 volt battery to conserve portable's battery. For semi-permanent installation, a 117VAC power pack is available. All power packs quickly snap in place, making changing easy.

AVAILABLE IN CHOICE OF 43 DIVERSIFIED MODELS



LOUDSPEAKER models available

TRANSISTORIZED greater operating efficiency

MANY ACCESSORIES for extra versatility

WRITE TODAY

Get the full facts on this power-packed portable. Ask for the 6-page folder which will help you select the HANDIE-TALKIE radiophone best suited for your requirement.

NOW current delivery

Your overwhelming demand for this new portable temporarily upset our delivery schedules. Production has been stepped up to provide current delivery.

TRANSISTORIZED Handie-Talkie®
PORTABLE RADIOPHONE

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC., 4501 W. Augusta Blvd., Chicago 51, Illinois
A Subsidiary of [illegible], Inc.

MOTOROLA and HANDIE-TALKIE are registered trademarks of Motorola, Inc.

Tough coverings on Anaconda Heavy Line Wire help solve your primary problem

ANACONDA Heavy Line Wire has been designed to solve your primary distribution problems—with today's higher voltages in mind.

It's made with a tough thermoplastic covering. This covering has high resistance to moisture, weathering and abrasion. It protects conductors from contact with wet and broken limbs—from damage caused by wind, rain, sleet and snow. There's greater freedom from faults, less pruning needed. You save money . . . improve public relations.

Covering consists either of rugged polyethylene or time-tested Anaconda Densheath* vinyl resin compound. Conductors are being supplied in copper, aluminum, and ACSR.

NEW BULLETIN DM-5705 contains full information, including sizes, diameters, etc., plus special sag and tension charts. See your distributor or the Man from Anaconda for free copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. *Reg. U. S. Pat. Off. 57418

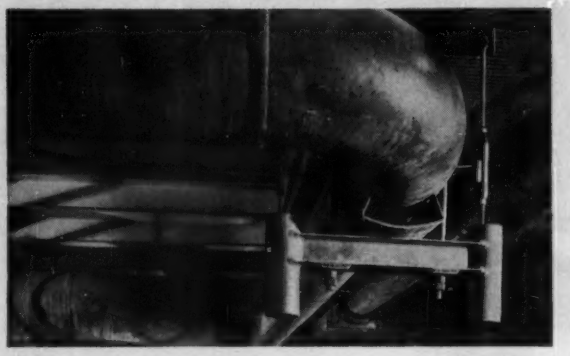
SEE THE MAN FROM **ANACONDA®**
FOR HEAVY LINE WIRE

BLAW-KNOX has what it takes—to provide these products and services

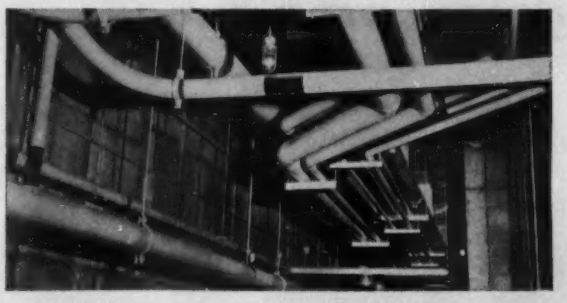
A Blaw-Knox automatic sprinkler system could have prevented this disastrous fire. Each year a serious fire strikes one out of seven manufacturing firms in this country. And out of every 100 firms who lose their records in a fire, 43 never reopen for business. So why take any chances.

Blaw-Knox engineers, fabricates and installs automatic sprinkler systems that are always alert to detect, confine and quench a fire at its origin. Qualified engineers custom-design systems that meet individual requirements—and fulfill all insurance standards and municipal codes. A Blaw-Knox automatic sprinkler system pays for itself in a few years through savings in reduced insurance premiums.

Let a Blaw-Knox fire-protection engineer study your needs, submit a layout and estimate, and tell you how you can pay for the system on our lease or deferred payment plan. For more complete information, write for Bulletin No. 2426—"Fire Can Destroy Your Business."



Blaw-Knox trapeze functional spring hangers, with the patented internal swivel action, support power piping in new generating station. Our experienced engineers are available to both design and make recommendations for your hanger requirements. For further information, send for Catalog No. 54.



High temperature, high pressure oil tunnel piping in large steel mill is typical of many piping systems prefabricated and erected by Blaw-Knox. Experienced piping engineers, modern shop facilities and a new Blaw-Knox digital computer method for fast, accurate calculation of piping stresses are available to you. Let us know your requirements and we will provide the service you need. For additional information, write for Bulletin No. 2443—"Piping for Industry."

BLAW-KNOX

BLAW-KNOX COMPANY

Power Piping and Sprinkler Division

829 Beaver Avenue • Pittsburgh 33, Pennsylvania

Complete facilities for prefabrication and erection of piping systems for all pressures and temperatures . . . complete line of standard and custom-engineered pipe hangers, supports and vibration eliminators . . . complete line of automatic sprinkler systems for standard and special hazards

GENERAL CABLE'S HIGH QUALITY CONTROL CABLE with IMPROVED COLOR CODING

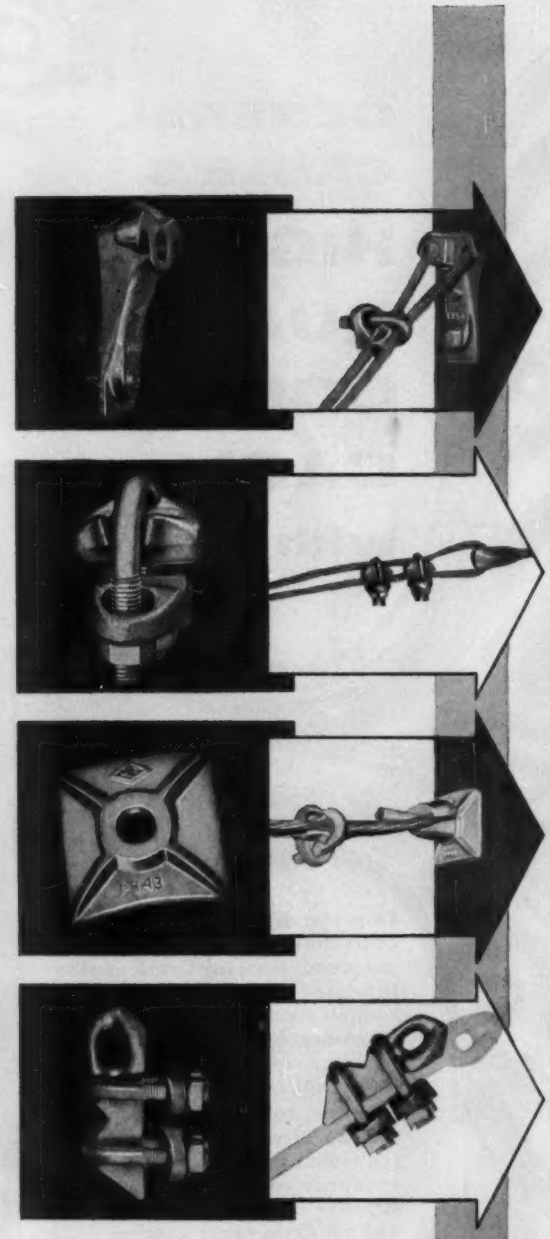
To preserve the superior physical characteristics inherent in black neoprene, General Cable applies a colored synthetic rubber base coating supplemented, where necessary, by spiral striping over the black neoprene jacket of individual conductors.

This new, carefully developed method of color coding the individual conductors of multiple conductor cable results in superior quality, brighter colors and an extra tough coating for permanence.

Station, Traffic, Elevator and Railway control cables are color coded in accordance with IPCEA Standard color sequence and to customer's specifications.

GENERAL CABLE CORPORATION,
420 Lexington Avenue,
New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast.

for quality and service . . . specify **GENERAL CABLE**



Make your guying EASIER, QUICKER, STRONGER, at less cost with

MIF

MALLEABLE IRON Pole Line Hardware

MIF Guy Hooks are so designed that a large portion of the vertical and horizontal components of the load are transmitted to the pole, placing the bolt in tension and thus relieving it of much of the shear and bending forces. The wide heel pad resists overturning, an integral wedge and spurs resist vertical movement, and the channel shaped back provides the best fit on the pole. Made-up guy loop is easily and quickly slipped over the hook at any time during construction and cannot come off unless rotated back to the engaging (horizontal) position. Solid one-piece construction puts every ounce of metal where it will do the most good.

MIF Guy Clamps feature lower weight and cost per unit of holding power—can be placed on the strand in a matter of seconds without disassembling—no special tools required. Clamping force of the "come-along" type grip increases as the load increases—for greater holding power. The wide range of strand diameters accommodated by each size reduces handling and inventory.

MIF Washers are specifically designed to assure top performance of hardware on the structure (for example, to help set the MIF Guy Hook most securely), to provide maximum effective bearing area and strength per unit of weight. Center hub and radial ribs reinforce the washer where it is needed—metal is placed in accordance with strength requirements.

MIF Span Guy Hooks, Thimble Bolt Eye Nuts, Auxiliary Eyes, etc., all of engineered construction, round out the full line of MIF Guying Hardware. Get the details by writing for our new illustrated price list.

MIF SINCE 1854 POLE HARDWARE DIVISION

MALLEABLE IRON FITTINGS CO.
BRANFORD, CONNECTICUT

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Hugo Sales Co., Minneapolis, Minn. Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • Line & Cable Accessories, Ltd., Toronto, Ontario, Canada • B. H. McCain, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La., Dallas, Houston, Tex., Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

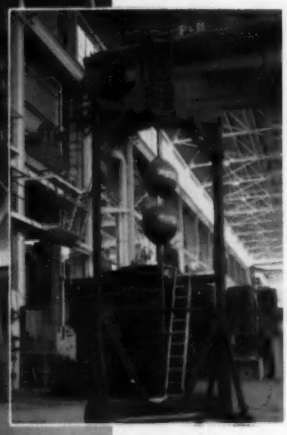
In observing the oscillogram pattern, the engineers are using an important tool . . . the surge generator . . . in the process of confirming the applications of Moloney's engineering know-how and experience. Successful test results are not things of chance. Many operations must be skillfully performed and specially designed fabricating and processing facilities must be used. Some of these are shown on the next pages and are visual evidence of why utilities think of Moloney and dependability as being synonomous.

PATTERN FOR PERFORMANCE

KNOW-HOW, SKILL AND FACILITIES!

Utility needs have been anticipated for today's and tomorrow's increased transformer ratings. Machinery designed and developed by Moloney makes many transformer fabrication operations routine. Within this building are... facilities for winding the largest concentric disc and concentric layer type coils ...specialized core stacking equipment ... drying ovens ... and large areas for assembling core-and-coils, tanking, and installing various items which result in a completed transformer. The space to work is here ... over 80 feet wide, 530 feet long and seven stories high. Transformers are moved by two huge cranes capable of operating independently or in tandem. Step by step ... each stage of manufacture employs the latest and best facilities for the industry's most skillful craftsmen.

MOLONEY ELECTRIC



LITHO U. S. A.

NEMA tests . . . your particular utility's test . . . and Moloney's own rigid quality and performance tests are made here. Adequate facilities to test transformers of any Kva rating are installed and in operation. When your transformer is built and tested by Moloney you have . . . dependability at its best.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Meter Standards Need Wider Acceptance

The progress toward standardization of watthour meter ratings that has been made to date by industry committees is substantial and encouraging. The seven current ratings that existed some 20 years ago have been reduced to two, and there are prospects of eventual standardization on a single meter good for 200 amperes.

Conspicuous as this progress has been, much remains to be done. Complete acceptance of existing standards needs to be fostered within individual meter departments and the concept of standardization extended beyond the realm of metering to include billing and rate-making functions as well.

The departure from standards and the resort to "specials" and unique metering combinations are truly astounding today. We are told, for example, that one meter maker lists some 400 basic metering units. All of these are available for socket mounting or bottom connection, and most for switchboard mounting. All can be had with clock or cyclometer registers. They can be supplied with four dials, five dials, or four dials multiplied by 10. Mechanical indicating demand registers are available for all of them, and most can have either thermal demand or graphic chart attachments. Thus this one manufacturer finds it necessary to list 40,000 catalog items, and another is called on to produce 17,890 different meter registers alone.

Even for the simple 15-ampere, single-phase watthour meter used in residential service, a typical listing includes 36 catalog numbers. Three of these 36 listings produce 76% of the sales, but 26 of the 36 numbers add a sales volume of *less* than 1% each.

The situation with polyphase watthour meters is similarly inconsistent with standardization as we understand it today.

Most of these diversified meter listings have come about as a result of the special demands of individual utilities. "Specials" have been ordered without a thought to the stultifying effect on standardization of manufacture or the cumulative effect on the cost of metering.

Nor is the meterman always responsible for this. Variables are frequently introduced by accounting and billing groups—some on the ground that billing machines will not handle more than four dials, while others with the same machines have no trouble with five. In some instances rates have been set without regard to metering cost, making it necessary to buy meters to fit the rate.

In this regard certainly, there is need to coordinate the basic requirements of modern metering with the modern mechanized billing procedures and to integrate these requirements with rate structures in a manner consistent with the objectives of overall industry standardization.

Meter standardization is advancing steadily. But its benefits will not be fully realized until standards already existing are accepted and followed. Nor can meter standardization advance much further until its objectives are understood by and coordinated with rating-making and accounting groups.

Let's Light the Welcome Mat

Here—waiting for a boost from the industry—is a residential lighting load that:

- Is already developing,
- Has a potential EAR of $3 to $5 per non-apartment dweller,
- Would be almost entirely off-peak, both seasonally and daily,
- Will require no additional circuits or new facilities by either the electric utility company or its residential customers.

Best described as "home approach" lighting, it calls for keeping outside entrance, porch, etc, lights burning from dark until the family retires for the night or until the last member of the family returns home.

This growing practice apparently got its start in the expanding suburbs. Here most people are escapees from the well-lighted streets of cities. Now living in areas with little or no street lighting, often on streets unmarked by signs to guide their visiting friends, they find a remedy in their own "home approach" lighting.

The industry can profit by encouraging this trend. It is not and never will be a substitute for better street lighting, but it will always be an efficient complement.

Purchasing Agents Favor Wider Competition

EEI Purchasing & Stores Committee hears

- **Wider competition is favored by all large companies, many smaller ones**
- **Exclusive contract with trucking firm can cut freight costs, improve service**
- **Some utilities are making progress in disposing of fly ash at a profit**
- **Foreign buying getting some notice**

J. B. HOMSHER

Majority of the nation's electric company purchasing agents like to see wide competition for their buying dollars. But in smaller companies they see advantages in restricting competition in order to cut buying and stores costs and to effect better public or commercial relations.

These were among the highlights of a survey prepared for the tenth annual meeting of the Edison Electric Institute Purchasing & Stores Committee held in Pittsburgh. The fast-paced, wide-ranging conference also featured papers on:

- Cutting Costs in Stores Operations.
- Better use of lead time.

In a two-day series of formal presentations, reports, informal commentaries, and panel discussions, the utility purchasing and stores men exchanged information on matters ranging from broad policy to such specifics as standardized packaging and fly ash disposal.

Wider Competition, Pro and Con

No doubt about it, purchasing agents like to be able to look to several suppliers when they buy an item. A survey of the buying policies of some 30 companies indicate the PA's favor maximum competition by a four-to-one mar-

How the Typical* Electric Company Looks at Buying

* "Typical" is used here to represent the majority answers from the EEI committee survey. It disregards minority opinions as well as the size and geographic location of the companies responding.

In the field of purchasing, the typical company:

1. Favors maximum competition for its buying dollar.
2. Makes an effort to obtain material from more than one vendor when the price is the same.
3. Takes quality, delivery, and price as well as past service record into consideration in selecting vendors.
4. Is willing to award to low bidder without further negotiations where more than three bids are taken.
5. Is unwilling to purchase from relatively high cost vendors to maintain active sources.
6. Does take bids on the major categories of materials and services, but not on spare parts.
7. Does not believe bidding should be confined to local sources.
8. Does maintain permanent buying records for most items which show competition results.
9. Has not made purchases from foreign sources.

In the inventory control area, the typical company:

1. Believes that wider competition does not cause suppliers to carry smaller stocks.
2. Does not believe that increased competition tends to increase coded items in inventory.

In area of stores, the typical company:

1. Believes that wider competition does not cause storage and handling problems because of variation in packaging.
2. Feels that wider competition does not make inventory taking more difficult.
3. Feels that maximum competition does not have adverse effect on cost of spare parts storage and records; however, believes that with maximum competition, it is a little more difficult to maintain system reserve stock of spare parts.
4. Believes that it is sound policy to induce suppliers to carry substantial stocks for its use, with a view to reducing the utility's inventory; also does not feel that such stocking by the vendor would increase the price.

R. B. GEAR

W. N. McCLELLAND

A. H. HAMILTON

gin. All the large companies were in the "maximum competition" column while the medium and small companies combined split 50-50 for restricted competition.

Probing deeper into the pros and cons of wider competition, the survey found that price control is thought to be better by advocates of both wide and restricted competition. Advocates of maximum competition thought their policies resulted in better service relations, better inventory control, and better public or commercial relations. But advocates of restricted competition cited some of the same reasons for their views.

In choosing vendors under either the wide open or restricted competition policies, the PA's indicated they relied on reputation in selecting new vendors or on past experience and preference in retaining other vendors. One respondent commented that vendors were chosen "from knowledge gained by interviewing representatives, trade publications and plant visits."

A majority of the companies favoring maximum competition indicated that the policy does not cause storage or handling problems due to wide variation in packaging, and it does not complicate the task of taking inventories.

Nearly half of the companies surveyed indicated they had made purchases from foreign sources, but subsequent discussion indicated these purchases were rare. Among the foreign items purchased are steel towers, condenser tubing, pipe, and air breakers. It was disclosed that several large construction contractors have recommended purchase of foreign condenser tubing.

In summing up the survey findings, Robert B. Gear, Commonwealth Edison Co, project committee chairman, said that good reasons were offered by both the proponents and opponents of maximum competition. "Those who are operating under restricted competition are probably providing their companies with as economical buying service as those who favor maximum competition," he concluded.

Cut Costs in Stores

Rising labor costs and equipment prices puts additional emphasis on trimming stores costs, said William N. McClelland, Consumers Power Co, he headed the project group looking into economies in the issue and return of stock material. His report urged stores men to be on the alert for opportunities to cut costs by:

- Reducing clerical functions to a bare minimum by correct handling of minor or exempt material, and the use of preprinted forms among others.
- Cutting freight costs wherever and whenever possible.
- Proper consideration of the human element in all our endeavors.
- Reducing handling costs through careful planning of warehouse arrangement, unit packaging, and the use of automation where possible.

In discussing possible savings which can be made on freight shipments between company warehouses, McClelland noted that shipment of less than truck load lots of material cost considerably more than full loads. Considering a truckload to be 20,000 pounds, it will cost $78.00 to ship that amount. Using less than truck load rate, it would cost the same amount to ship only 8,500 pounds. Therefore anything between 8,500 and 20,000 lbs may be shipped "free", he said.

McClelland reported that one company is operating with a contract carrier to have material shipped from its central warehouse to substores. The arrangement provides that an individual with a fleet of trucks does all the hauling for this one utility. He cannot haul material for any other outfit, but he is not restricted to certain areas or routes as a commercial trucking company would be.

With this arrangement, the utility reports saving of 25% to 30% as compared with the costs of distributing materials by means of the cheapest alternate form of public carrier—that is, less carload railroad freight. The savings would be even greater if the costs of the contract deliveries was compared to public carrier truck or express costs.

In appraising the advantage of the contract carrier arrangement, McClelland reported the following savings:

1. It eliminates hundreds of shipments on which it would be neces-

(Continued on page 165)

Unions Attack AEC as PRDC Probe Re-opens

Three labor groups hit at AEC rules, standards, and practices of issuing construction permit for reactor; question safety and financing of project

The three labor unions opposing AEC's construction permit to Power Reactor Development Co have shown as the hearings re-opened this week how they plan to attack.

The union's handling of their first witnesses indicates they plan to document their charges that: AEC has only very general rules governing issuance of atomic power licenses; that there are virtually no specific requirements by which to judge an applicant; that in practice AEC need follow no rules at all; and that licenses can be granted arbitrarily.

The United Auto Workers, International Paperworkers and International Electrical Workers subpoenaed as their lead-off witnesses two AEC officials: Kenneth Fields, AEC general manager, and AEC Attorney James Morrison.

Siegal Searches AEC's Methods

Through them Union Counsel Benjamin C. Siegal sought to reveal the standards and criteria established by AEC to determine the financial and technical competence of PRDC and how AEC determines whether a given reactor would be safe at a given site.

The unions have charged that AEC issued the permit for the 100,000-kw, $43.2-million fast breeder reactor at Monroe, Mich., without establishing that the project would be safe or that PRDC was financially able to undertake the job.

Fields testified that AEC had no criteria other than its published regulations for determining an applicant's financial qualifications.

Plutonium Price Questioned

Siegal hammered away at whether AEC regarded as a contributing factor to financial qualifications such things as AEC research contributions and the higher than published price of plutonium AEC will pay PRDC for the plutonium to be produced at Monroe.

Siegal also asked Fields whether AEC had any criteria for determining whether a reactor would be safe at one site and not at another; whether AEC could determine that a site was safe before it knew whether a reactor was safe. Fields said these were matters of judgment for individual cases.

Fast Tax Writeoffs Seen Doomed

The political furor on Capitol Hill over Idaho Power Co getting rapid tax amortization on its two new Snake River plants has accelerated the drive to end the program for giving tax benefits to expand industrial capacity.

President Eisenhower, Treasury Sec'y George Humphrey, and Sen Harry Byrd (D-Va.), have come out against granting any more tax writeoffs except to companies producing goods or doing technical research and development work directly for defense.

This leaves out on a shaky limb the new director of Office of Defense Mobilization, Gordon Gray, who granted the Idaho Power certificates and who opposes Byrd's move to restrict tax writeoffs.

Senate Finance Committee hearings, headed by Byrd, condemned both the program and the granting of the Idaho Power writeoffs. Byrd can't write tax legislation in the Senate (only the House can initiate tax measures). But he does hope, with bi-partisan support, to tack his anti-writeoff proposal on any tax bill that comes from the House.

Whether or not new legislation is passed this year, the agitation against fast writeoffs means the end of the rapid writeoff for all but the most direct military suppliers.

Accelerated tax amortization, used during World War II and the Korean conflict, is aimed at providing industry with an incentive to expand production capacity of items needed for national security.

It authorizes ODM to set expansion goals for various industries of importance to national defense and grant applications for fast writeoffs under these goals. These "certificates of necessity" allow a firm to write off against income for tax purposes in five years the cost of capital goods ordinarily amortizable over the life-of-the-item span.

At the peak of the Korean program, there were 229 goals. ODM has been closing them rapidly since the conflict ended. Since December, 16 of the 24 goals then open have been closed. Of the remainder Gray is considering shutting down all but three: military and AEC procurement, research and development, and liquid nitrogen and oxygen. Except for the last goal, Gray says he is willing to restrict—administratively—the program to the same military limitations Byrd is aiming at.

Byrd, with the strong political backing of Democratic public-power advocates on the Finance Committee, called the Idaho Power grants "shocking and without any defense justification whatsoever."

Gray said the Idaho grants were approved after the electric power goal had been closed on "equitable considerations" because the additional kilowattage involved was administratively counted into what ODM felt was needed to boost capacity nationally. There are now no applications pending from utilities.

TVA Financing Debate Rages

Sammis proposes that nearby utilities supply area's future needs; Sutton offers 10-point plan; compromise is disputed; but all agree—the situation is urgent

Congress was urged last week not to relinquish control of the Tennessee Valley Authority by approving bills to permit revenue bond financing of future TVA expansion.

Walter H. Sammis, president of Ohio Edison Co and speaking for the private electric utility industry, and Louis V. Sutton, president of Carolina Power & Light Co and speaking for the U. S. Chamber of Commerce, told a House public works subcommittee that further investment in TVA should be halted. They said further, that TVA's present operations should be put on a footing comparable to private utility operations to eliminate unfair competition.

The hearings were on two identical measures sponsored by Rep Robert Jones (D-Ala.) and Rep Clifford Davis (D-Tenn.). Previously, a Senate Public Works subcommittee had held hearings on two other bills, one sponsored by Sen Robert Kerr (D-Okla.) and one by Sen John S. Cooper (R-Ky.).

Sammis suggested that the area's future additional power needs be supplied by neighboring private utilities. "I know of no statutory mandate which requires TVA to assume the exclusive responsibility of furnishing all present and future power requirements in the area served by TVA," he said.

Sutton Offers 10-Point Program

Sutton offered a 10-point program to the solution of the TVA problem. TVA in its 25 years of operation, has gone far beyond the definition of "surplus power" in the original act, he said.

The Sutton program would require no further funds from any source for TVA; a new rate structure to reflect all costs; payment of principle, interest, local and federal taxes; payment of depreciation accruals; annual general accounting office auditing of TVA operations to continue; limiting TVA to its present service area; and permitting local private or public power agencies to purchase all or any part of TVA's plants and transmission facilities.

As the TVA bond picture develops, the dispute seems to be breaking down to two major issues:

- Can a TVA self-financing bill be passed in this session without acceptance of limitations on TVA's activities?
- If compromises are accepted, will they endanger TVA's future?

Supporters of the various bills, while disagreeing on the answers, agree on one point—a self-financing bill must be passed this session if the TVA area is not to face a power shortage by the winter of 1959-60, compromise or not.

WASHINGTON COMMENT

Who'll Fill Curtis' TVA Seat?

V. CRAIG RICHTER,
Washington Correspondent

The finding of a TVA director—to succeed Dr Harry A. Curtis whose term expired last week—is one of the most difficult political talent hunts of Eisenhower's career.

The office of a TVA director offers little opportunity for advancement. The $20,000-a-year salary is not regarded as sufficient compensation for the job; any utility executive carrying equally large similar responsibilities would be making several times that much. Furthermore, for a business executive, the nine-year term, square in the middle of the public-vs-private power shooting, is not likely to sound attractive.

Every move of the new TVA director will be closely scrutinized by public and private proponents.

It is not surprising therefore that the President has spent months to find the right man for the post.

Curtis was one of the two remaining new dealers on the three-man TVA board. The other is Dr Raymond Paty. Both have been frequently in violent disagreement with Brig Gen Herbert Vogel, the Eisenhower-appointed chairman.

What kind of man has the President sought for the job?

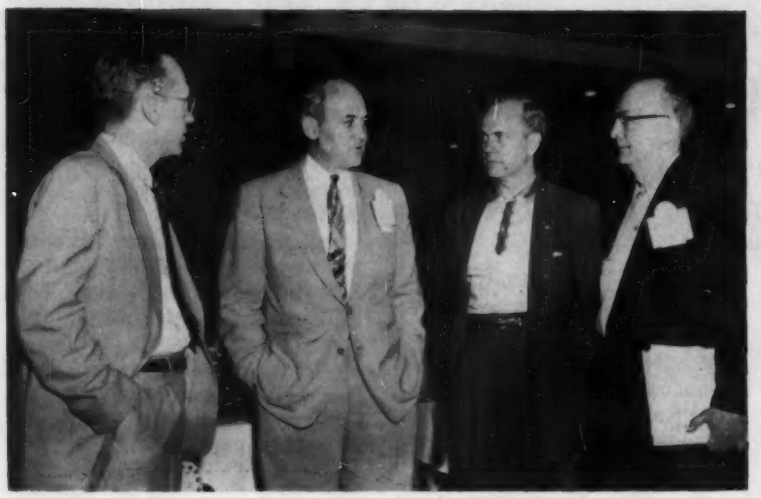
The best information on this score is that he sought someone who—aside from obvious qualifications and executive ability needed to help run the largest power system in the world—can hew to the middle of the road, favoring neither federal nor private extremists.

Two Men Have Declined Already

According to Washington grapevine, at least two and possibly more of the President's first choices for the job declined the offer. Their names have not been disclosed.

In his search for the right man, Eisenhower has relied heavily on the advice of Kentucky's Sen John Sherman Cooper who has strong support in the region.

At one time or another during the past months, a number of names have been mentioned for the job. They include: Ancher Nelson, former REA administrator and unsuccessful candidate for governor of Minnesota in the last election; Edward F. Mynatt, Agriculture Department assistant general counsel for credit and conservation, and a Jefferson City, Tenn., co-op member; Edwin R. Denney, Kentucky Republican nominee for governor against A. B. Chandler in 1955; Louie B. Nunn, Glasgow, Ky., county judge; and Rep Howard H. Baker, Republican Congressman from Huntsville, Tenn. As of last week, the grapevine had it that the President was trying to find his nominee from outside the TVA area.



Three of These Men* Give . . .

Insight into Nuclear Safety

Atomic power plant safeguarding received added documentation in Miami last fortnight. Members of the accident prevention committees of Edison Electric Institute and Southeastern Electric Exchange heard that nuclear energy and materials used for putting the atom to work will pose "fascinating problems" for safety engineers. But the problems are not deterring atomic progress. Their solution, in fact, is returning added dividends.

William W. Allison, Westinghouse Electric Corp, told how safeguards and handling procedures for zirconium processing saves operation time while increasing output.

Safety engineers will face atomic power problems "sooner than you realize," Allison said. What kind? "In addition to radiation there will be materials handling, caustics, acids, solvents, gases, explosive chemicals, shears, forge presses, rolling mills, extrusion presses, and pyrophoric materials," he said.

Allison described steps 80 Duquesne Light Co employees will follow, their clothing and other requirements, and the two-year training Shippingport workers get.

Scare headlines of newspaper "horror" stories presents an education job for safety directors, said Daniel F. Hayes, Atomic Energy Commission.

Hazards—potential and real—should not be minimized, Hayes said. "Fall-out" and "run-away" terms will have to be interpreted in terms of known types of hazard exposure. And the safety director's approach will vary as to "type of people, community, and reactor you're going to build."

Employees may be apprehensive, Hayes said, about radiation reports they've read. There may be cases where claimants believe they're injured but actually they won't be. Maintenance of radiation exposure records consequently will be important, he said.

Coming—A Safety Task Force

Plans to appoint a task force which would guide and investigate accident prevention in nuclear power generation were announced by William Leone, Consolidated Edison Co, and chairman of EEI's atomic energy subcommittee. The group will consist of engineers, health physicists, and doctors with reactor and/or radiation know-how.

Trend is upward on all workmen's compensation, said Raymond S. Metzger, safety head, Toledo Edison Co. He referred registrants to a bulletin (No. 188) by Bureau of Labor Statistics which covers statutes through Oct. 1956.

State occupational disease laws are being rewritten to include a ten-year limit for radiation exposure claims, he said.

Strides toward the day when portable defibrillation units will be in use were outlined by William C. Bremner, superintendent of safety, Commonwealth Edison Co. Already proved successful in hospital work, the units should be on line trucks "within a couple of years," Bremner stated. The device halts ventricular fibrillation—heart tremors—which frequently cause fatalities in electric shock accidents.

Members of the EEI committee stressed that premature use of such devices could hinder progress made to date. They recommended utilities wait until scientific research is completed before trying units.

Dr W. B. Kouwenhoven, the man who has led the fibrillation attack at Johns Hopkins Hospital the past six years, said units could save nearly all ventricular fibrillation victims if reached within one minute.

The defibrillator unit produces no ill effects when used on a man not in fibrillation, Dr Kouwenhoven said. He knows. An assistant accidentally gave him a 440-v jolt during experiments on a dog.

Lineman's 'Armor' Problem Hit

The industry should be "eliminating pole line hazards so it will be unnecessary to dress your linemen in an almost completely covering protective suit of armor, rubber sleeves and gloves." This was view of Chester C. Coon, retired manufacturer of hot stick tools and former lineman in rugged "boomer" days.

Coon said, "Any good management should insist" that workmen be trained in safe practices. It's a "lame excuse", though, when a safety man says "if I could only get management's attention we could have a greatly improved safety record." Instead of complaining, "you'll be doing yourself and your industry a more creditable service if you will . . . find out your specific exposure problems and seek the help of all concerned in eliminating them."

Reports were made on improved 1956 injury rates: Frequency was 6.84; severity, 1,384 (EW, May 6, p 50). Motor vehicle report for 42 companies was 1.52 accidents per million miles vs 1.75 in 1955.

*From left, Joseph C. Egg, director, training and accident prevention, Duquesne Light Co; D. F. Hayes, chief of safety and health division, Atomic Energy Commission; W. W. Allison, safety supervisor, Bettis Atomic Power Division, Westinghouse Electric Corp; William Leone, assistant safety director, Consolidated Edison Co. of New York, Inc.

Texas Group to Study Fusion Experimentally

Eleven utilities authorize 4-year research aimed at showing whether thermonuclear energy can be controlled; no immediate commercial applications in prospect

Eleven electric utilities comprising the Texas Atomic Energy Research Foundation have signed a contract with General Atomic division of General Dynamics Corp for a four-year, $10-million research program to explore the possibilities of controlling fusion reactions.

The object of this program is that of understanding heavy-hydrogen reactions at high temperatures under controlled conditions. The first big step, however, aims at demonstrating that the fusion process can be controlled.

At the moment, there are no immediate prospects for economical electrical energy production from this source.

This is the first large-scale private program to explore this area of science. The Atomic Energy Commission already is working on the problem.

The research, already in progress, is being conducted at General Atomic's John Jay Hopkins Laboratory for Pure and Applied Science at the northern edge of San Diego. The lab's staff now includes more than 150 scientists, engineers, and technicians.

If the experimenters are able to develop a system in which more energy is developed than is consumed in controlling the reaction, the future will hold an "almost unlimited energy source because of the great quantities of heavy hydrogen (deuterium) in the sea," reports General Dynamics.

Furthermore, the process does not involve problems associated with large-scale radioactive waste disposal, stated Foundation's Pres W. A. Parrish, who is also president of Houston Lighting & Power Co.

Participating utilities are: Central Power & Light Co, Community Public Service Co, Dallas Power & Light Co, El Paso Electric Co, Gulf States Utilities Co, Houston Lighting & Power Co, Southwestern Gas & Electric Co, Southwestern Public Service Co, Texas Electric Service Co, Texas Power & Light Co, and West Texas Utilities Co.

EEI's Atom Task Force Issues Progress Report

Edison Electric Institute's Technical Appraisal Task Force on Nuclear Power has issued its first report, according to the May 6 edition of "Industrial News Review," published by E. Hofer & Sons, Portland, Ore.

The Review said the report reached significant conclusions, citing from the EEI report:

"Because of the newness of the power reactor art and the resultant lack of accurate specific information . . . economic analysis of overall performance of stationary power reactors at this time would be of little real value."

"There are no clear-cut examples of reactors 'ready and waiting' to be built in prototype or larger size except possibly those already being developed in those sizes."

"Because of factors that cannot be accurately evaluated in practically every reactor variety, the Task Force does not expect it will be able to state categorically that Reactor A is the best, Reactor B the next best, and so on."

New Atomic Fuel Developed

Ceramic pellets of urania-thoria have been developed and used at Argonne National Laboratory facilities to produce heat for electricity from a nuclear reactor.

This was reported to the American Ceramic Society in Dallas recently by four Argonne scientists and engineers.

The developmental work was done at the Laboratory's Lemont, Ill., site, and the pellets now are being used in a Borax series experimental reactor at Argonne's National Reactor Testing Station near Idaho Falls, Idaho.

Uranium, Thorium Are Mixed

The use of thorium and uranium oxides in combination as a nuclear fuel has not been tried before, reports the Laboratory. Advantages offered by ceramics fuel elements are that, unlike metallic elements, they do not grow and become distorted under intense irradiation. They also resist high temperatures and corrosion in water.

The rolling of uranium metal tends to unify crystals in a single direction, the Laboratory explains. When most of the crystals lie in one direction, changes due to irradiation are enormously increased in that direction. But ceramic crystals lie in all directions, minimizing the expansion effect of irradiation.

The ceramic specimens prepared were tested both with and without an outside metal covering. Aluminum nickel alloy, stainless steel, and Zircaloy-II coverings were used on some specimens. The various fuel elements showed "good resistance" to corrosion in either water or NaK (sodium-potassium mixture).

A-Plant for Carolina Group

Carolinas Virginia Nuclear Power Associates have worked out an agreement with Westinghouse Electric Corp for development of a nuclear power plant to be completed about 1962 in the area served by the four member utilities.

Neil Simpson: Live-Wire Leader of Black Hills Power & Light

Simpson—active businessman, avid hunter, civic "joiner"—rises from "part-time flunky" to utility president

Neil G. Simpson, who joined Black Hills Power & Light Co 20 years ago as a "part-time flunky" while going to college, has risen to president on a simple formula: Hard work.

But 44-year-old Simpson explains his meteoric rise modestly—"I'm just a common individual who's been in the right place at the right time."

A former college football star, Simpson still had an athletic build when he took over the presidency of Black Hills on May 1, succeeding J. B. French, who was elevated to the chairman of the board.

Getting out of high school in Chadron, Neb., at the height of the depression in 1931, Simpson had to work his way through South Dakota School of Mines.

College Took 8 Years

"It took me eight years to finally get through the place," he remarked. "I carried only a few hours each semester as I was working full time and playing football."

He worked as hotel bellhop, kitchen boy in a fraternity house, and drugstore clerk before finally landing a part-time job with Dakota Power Co in September, 1937.

"I was a flunky wherever they needed any extra help," Simpson said, adding he had worked as serviceman, storeroom clerk, sales engineer, office clerk, and lineman. He went on a full-time basis after graduating from a general engineering course in January, 1939.

"I had just a smattering of electrical engineering—just enough to get by," he said.

Simpson got a "break" with Dakota Power shortly after joining the firm. He met Virginia Pier, who was working in the home service department. And he married her while still going to college.

Mrs. Simpson has carved a successful career for herself, too. While attending University of South Dakota she was chosen Miss South Dakota. ("Don't ask me what year as I don't remember," Simpson said.) She's taken an interest in Rapid City school affairs, was the first woman school board member, and is the board's immediate past president.

South Dakota School of Mines is not noted for its football teams, but the 1938 team which Simpson captained has gone down in history as one of its better teams.

Was Effective Football End . . . (?)

"Some of the boys I played against were pretty big—and some of them ran right over me," he said. "And those that didn't, ran around me."

Simpson was only 5 feet 11½ inches tall and tipped the scales at 150 pounds at the time, but he was an all-conference end in 1937 and 1938 and won honorable mention on All South Dakota college team in 1936. He also co-captained the 1937 squad.

When Black Hills P&L was organized in 1941, taking over the old Dakota Power, Simpson was named local manager at Rapid City. In 1946 he was elected to the board and four years later became vice president and general manager.

Simpson said he plans no change in any of Black Hills' policies. "I've worked with Mr. French for 20 years and while we're a small utility, he's quite a planner for the future," he said. "I couldn't improve upon the policies that he's set down. We have what we think is a progressive utility."

Although Black Hills has more than $2 million in construction program outlined, Simpson said it is "normal construction to take care of expansion, distribution and transmission facilities—no major changes outlined."

Was 'Exhausted Rooster' at 36

Simpson is a "joiner" who was particularly active in Junior Chamber of Commerce work until he became an "Exhausted Rooster" on reaching his 36th birthday. He was president of the Rapid City chapter and was state president and national director in 1943-44.

He's a member of the Rapid City Chamber of Commerce board of directors and has been vice president three years; past president of the Rotary Club and of the Community Chest; and is now president of Arrowhead Country Club.

An avid bird hunter, Simpson's staked out a favorite duck blind near Martin, S. D. But he spurns business talk on hunting trips, explaining, "I go for hunting, not business."

However, he admitted getting in a few business licks on the golf course. He said he usually shoots in the low 90's, "but I've been too busy to play any yet this year."

The Simpsons have four active children—Pier, 15; Roger, 13; Martha, 11, and Mary, 8—"and they keep me pretty busy," he said.

Working your way through college has a lot of benefits, Simpson believes. "It kept me busy and kept me out of trouble," he said. And it also gave him a start in the electrical utility business.

Public Power Sidelight

Each speaker at the Northwest Public Power Assn's April 23-24 engineering-and-operations workshop was asked in advance to deliver 250 copies of his paper to the registration desk on the morning of the first meeting in Tacoma. Style and format was prescribed. The papers were to be bound into a book, speakers were advised, with an attendance list and program which would double as an index. The book subsequently was handed out (having been bound, trimmed, and taped at a local print shop) at the end of the meeting. Many speakers, knowing their papers were to be in the book, summarized the contents, creating more time for discussion.

Line-Building in Northwest

Idaho Power Co has begun building a $4.5-million, 230-kv transmission line to bring Brownlee Dam power into the system at Boise 100 miles away. Supported by 409 steel towers ranging in height from 100 to 150 ft, this will be the biggest line on the company's system. The steel towers will be capable of carrying two circuits, each to operate at 230-kv. One circuit will be installed initially. Average span will be about 1,300 ft. The maximum span, capitalizing upon the rolling terrain, will sweep ahead 3,500 ft.

A 230-kv, 42-mile wood tower line also is being built from Brownlee to Baker, Ore., to provide a power interchange tie-in with members of the Northwest Power Pool. This line will cost about $1.3 million.

Idaho Power has contemplated a 230-kv "backbone" for some time, having already built a line from Boise to American Falls capable of conversion to the higher voltage.

Meanwhile, E. M. Naughton, president of Utah Power & Light Co, disclosed plans for transmission systems to distribute Upper Colorado River project power to the fast-growing oil and uranium territory in his state. Surveys now are in progress, he said, on a $2-million project to establish high voltage lines from the $108-million, 900-Mw Glen Canyon project to Utah consumers.

For "Substantial" Savings

This year Toledo Edison Co will bring in by barge 90% of its fuel requirements, the company says. This is nearly double the amount delivered to the utility by boat last year. First shipment this year arrived March 29. By the end of the shipping season in December, a contracted 960,000 tons should have been delivered to the Acme and Bay Shore docks.

Rail freight rates for coal, the company explains, have jumped 59% in the last ten years from the district which is the utility's principal source of fuel supply. Shipment by boat to Lakefront Docks costs about 60¢ a ton less than direct rail shipment to Bay Shore less than a quarter of a mile away, the company said.

Getting Set for Summer

An Alabama Power Co construction crew has helped expand the cooling capacity of a large autotransformer at the Pinckard substation, the company reports. Although such jobs require extensive welding and usually are done at a factory, this work was done on location by welders sent by the tank manufacturer.

By-passing the 115-230-kv autotransformer was necessary for two weeks. Ten radiators were added to supplement the original ten. They were hung on pipe headers instead of the tank itself, the company reports.

This was accomplished by fabricating boxes to cover the valves of the original ten radiators on one side of the tank. The tank was filled to capacity with oil while the boxes were being welded. While oil was being drained, nitrogen gas was pumped into the tank so that parts of the radiator valves could be removed and covers welded on boxes.

Achieving Recognition

San Antonio's Public Service Board has outfitted its trouble-shooters in khakis, with the Board's emblem emblazoned on the shirts. Object: To help the public recognize the men as bona-fide Public Service representatives. In addition, the men now wear yellow helmets "which should help to eliminate all doubt," the Board hopes. The trouble-shooters got their uniforms after several incidents with skeptical customers who refused them entrance. The Board's meter readers have been uniformed for years.

That Tax Still Applies

The manufacturers excise tax still applies when electric light bulbs are provided either with or without charge to municipal electric light plant customers, reports the May 6, Internal Revenue Bulletin. Section 4131 of the 1954 Internal Revenue Code imposes a tax upon the sale by the manufacturer, producer, or importer of electric bulbs and tubes. Under Section 4224, no manufacturers excise tax attaches upon sale of any article for exclusive use of any State, Territory, or the District of Columbia, the Bulletin declared. Accordingly, it said, the tax does not apply to light bulbs sold for a municipality's exclusive use, but does apply when the bulbs are provided to the municipal's non-governmental power buyers.

Metermen Told of New Sample-Test Method

EEI-AEIC Florida meeting given single-phase meter procedure, supersonic method of cleaning demand registers

Public service commissions in Virginia and North Carolina authorized Virginia Electric Power Co to use a new sampling method for routine testing of single-phase meters. Details of the plan were disclosed to the EEI-AEIC Meter and Service Committees at St. Petersburg, Fla., late last month.

VEPCO uses results of annual tests on a 1% sample to guide selection to types, makes, and ages of meters for concentrated testing. W. C. Harrison said that the plan permits the company to concentrate its testing on types which the sample shows are most frequently outside the allowable error due to age, type, or location.

Test Every 100th Meter

Although the exact percentage of total meters in the sample is not specified, VEPCO selects every 100th meter in its file of billing stencils. It formerly tested the 835,000 single-phase meters every eight years.

Long Island Lighting Co may save an estimated $11,000 a year through its supersonic cleaning of demand registers, John Dye said. The method employs sound frequencies of 19 kc at 250 w to agitate a solvent bath of trichlorethylene in which registers are immersed for 30 secs. Some 95% of registers cleaned this way are restored to the original condition; 5% require complete overhaul.

K. S. Field, Ebasco Services, said that the greatest opportunities for further application of automation lie in minimizing the keeping of department records. It is clerical, voluminous, time consuming, and tedious, he pointed out in suggesting that automation might effect economies, conserve manpower, and do a better job. He observed that automation is not new to meter work, being used today in bank testing of meters and the use of accounting machines in meter work.

Application of statistical and quality control methods by Long Island Lighting Co accomplishes the following:

1. Acceptance sampling of new meters.
2. Comparison of meters by age, type, nameplate.
3. Comparison of meters by year of last test.
4. Systematic measurement of meter performance on a least-cost basis to guide purchasing.

Use is made of mark-sensing and digital computers for analysis of accuracy records in such work, said John Dye.

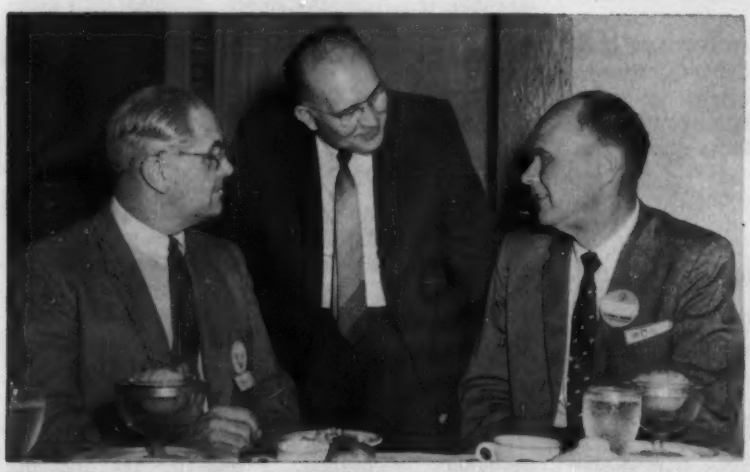
In a plea for further standardization, R. B. Swallow, Public Service Electric & Gas Co, said that one meter manufacturer is called upon today to list 17,890 meter registers, including variations in nameplate markings, ratios, types, gear reductions, etc. For the simple 15-amp, single-phase watthour meter in residential service there are 36 catalog numbers in a typical listing. Of these, three items produce 76% of all sales; 26 meters listed add a sales volume of less than 1% each.

Seeks Committee Wishes

James Patton, Sangamo Electric Co, asked that utility metermen express their wishes regarding alternate designs in 4-wire, wye, two-stator (element) meters. He pointed out that different things can be done with respect to constants and connections, so that this meter can also be used for measurement of 4-wire, delta service as a step toward simplification of polyphase metering. Patton discussed methods of measuring wye networks with single-stator meters and asked the committee whether manufacturers should go into this area or confine themselves to two-stator designs.

C. V. Morey, Consolidated Edison Co, in evaluating the desirability and practicability of a universal multi-stator watthour meter, questioned the immediate applicability of a 4-wire, polyphase, two-stator meter equally suited to wye and delta systems.

Although the price index of turbines, boilers switchgear, and motors has doubled since 1946, that for single-phase meters has climbed about 50%, said Bruce Gravitt, General Electric Co. Similarly, he said, while the cost index of wages and component materials, such as copper, aluminum, and steel, increased about 85% in this decade, the manufacturing cost of single-phase meters increased about 50%. He attributed the price stability of watthour meters to the rapid pace of standardization and the expenditures of meter manufacturers for research and development.



WELCOME was extended to EEI-AEIC Meter and Service Committees by W. J. Clapp, right, president, Florida Power Corp, in St. Petersburg. At left is G. J. Yanda, Cleveland Electric Illuminating Co, EEI chairman. J. S. Lineback, Cincinnati Gas & Electric Co, center, is AEIC chairman.

DELEGATES chatting are Idaho Power Co's J. F. Emery, J. T. Kimball; J. H. Steede, British Columbia Electric; and E. M. Naughton, Utah P&L; and A. F. Kreig. Naughton is president of NELPA, and Kreig the new executive manager

NELPA Told Advantages of Gas Turbine

Sun Valley meeting hears of uses for peaking capacity and hydro firming in low-temperature areas

Gas turbines hold promise for peaking capacity and hydro firming, the Northwest Electric Light & Power Association was told at its April 24-25 meeting at Sun Valley, Idaho.

Such uses are already increasing in the Northwest, as gas becomes increasingly available, especially in areas having low ambient temperatures, said P. H. Light, General Electric Co. He gave $125 per installed kw as the typical cost for a two-unit, 32-Mw unattended station.

Radar Mapping Described

In his opening address, E. M. Naughton, president of both Utah Power & Light Co and of NELPA, attacked the power marketing preference and investor-owned company tax inequalities. He was heard by some 400 delegates, attending this annual joint meeting of the Engineering & Operating Section, the Personnel & Safety Section, and the Purchasing Committee.

High-frequency, aerial mapping locates transmission lines more accurately in rough country, said F. O. Wollaston, British Columbia Engineering Co. Helicopter-carried master-slave stations, he said, can use electromagnetic wave transit time to locate lines within 8 in. in 40 miles.

New semi-automatic stations make small hydro plants important again for generation, said O. D. Lanning, California Pacific Utilities Co. Their generation, he said, is controlled by forebay step relays, and visiting personnel make periodic adjustments.

Curves for designing primaries, transformers, secondaries, and services for electric heating loads were presented by R. E. Sinclair, Pacific Power & Light Co. The curves, he said, were developed from field test data and represent large groups of houses with known loads.

But tests by Portland General Electric Co show tentatively that heat pumps are not bringing compensatory returns at present rates, said J. D. Simons. He added, however, that where air conditioning is required, the resultant higher load factor should make heat pumps attractive. M. G. Kennedy, Ebasco Services, noted that electric heating equipment sales are increasing 30% annually.

Ability to handle many channels per circuit largely accounts for the increased use of microwave communications by utility companies, said A. A. Noon, Puget Sound Power & Light Co. Power line carrier, he noted, is suffering from spectrum crowding.

Montana Power Co has installed about 540 miles of microwave at about $100 per channel mile, it was announced by E. E. Beardslee. Reception, he said, is excellent. A. G. Day, Idaho Power Co, predicted that microwave will carry TV channels for telemetering and inspection.

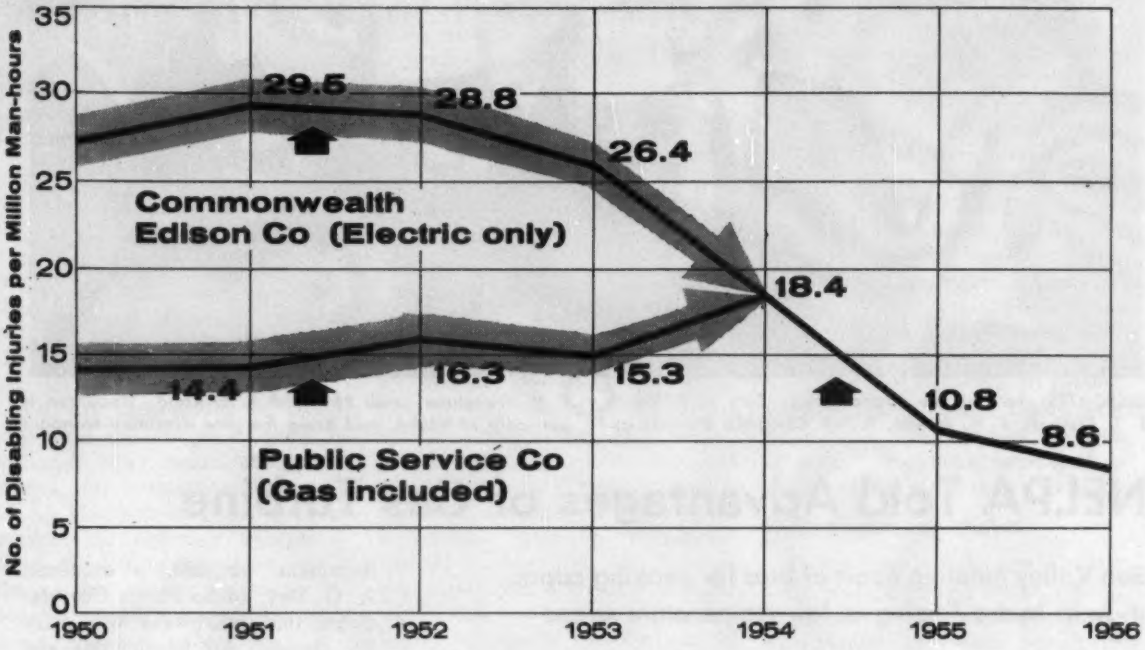
About 50 of the 250 utilities that can justify it have digital computers installed or on order, reported J. H. Rogers, IBM Corp. P. G. Morse, GE, described a desk-top analog computer which will be marketed at about $8,000. Called the MANIAC, it provides four generators, 15 buses, and 40 impedance units.

Cites L V Meter Use

Automatic economic dispatch devices using predetermined loading curves and the concept of equal incremental loading operate systems which total more than 40-million kw of US generation, said M. D. Liechty, Leeds & Northrup Co. Some of these, he added, have substantial hydro components.

About 400 Utah P&L accounts have low-voltage metering for high-voltage billing, reported F. O. Wald. Usually bills are adjusted using transformer loss curves, he said, although a few large accounts have transformer loss compensators. He put total equipment savings at an estimated $372,500.

Load-transient release of previously absorbed gas bubbles in the oil sometimes requires limiting maximum pressure in gas-sealed transformers, said N. E. Dillow, GE, adding that as bubbling reduces dielectric strength, it may contribute to failure.



1954 Frequency Rate Cut in Half as Change to . . .

Staff Authority Setup Aids Safety

W. C. BREMNER, Superintendent of Safety, Commonwealth Edison Company, Chicago, Illinois

Safety activities of Commonwealth Edison Co and its subsidiary, Public Service Co of Northern Illinois, were combined in 1954 and placed under jurisdiction of the industrial relations department. Before that, both companies had a safety section in industrial relations although most Commonwealth Edison activities were carried on in each department as its supervisor directed.

This had the disadvantage that in departments where the superintendent was "pushing" safety, there might be several men devoting their entire time to accident prevention. Meanwhile, in others, no one was assigned to hold safety meetings, make inspections, stimulate interest, and see to other items needed in active, successful accident prevention.

Over-all advantages of the changed setup can best be seen in the accident frequency chart above.

Other advantages in combining safety activities and assigning personnel to industrial relations include these items:

1. Every department or group gets its proper share of a safety program, based on requirements and type of work. For example, all line groups receive similar treatment, although this is more extensive than that given to accounting or treasury employees.

2. When a particular department's or group's accident rate increases or doesn't decrease as rapidly as other areas, additional effort can be applied by assigning more safety advisors, or giving more time of the group's usual advisor to its accident prevention.

3. Ideas, gimmicks, and programs effectively used in one area can be transferred to another and, when applicable, used company-wide.

4. Accidents which occur in one location can easily be discussed at another. For example, two men are assigned to generating stations; each man serves six. A serious accident or "near miss" at a station can be illustrated and discussed at the next meeting of other stations.

5. If a safety advisor and a department head disagree, the safety advisor feels free to go to "higher authority" and get the issue settled. Formerly, when he worked for the department head, he hesitated to "argue with the boss."

6. Company-wide campaigns or drives can be initiated, approval obtained, and the program put into effect with a minimum of lost time and maximum effectiveness. For example, early in 1955, a "Safety Week" campaign was conducted. For the first time in the company's history, no disabling injury occurred during the entire week, although the 1954 average had been 11 per week.

"Careful Effort Produces Safety". This is the motto

of Commonwealth Edison Co and its Public Service Co division. The idea contained in this statement, chosen last year from 6,400 entries in a system-wide slogan contest, applies not only to all employees, but to those directly engaged in promoting the company's safety program.

We believe safety is a matter of selling. Here are some ideas we use:

Signs: From the time a job applicant enters the employment office until he "signs off" years later, employees are besieged with signs. They may be large outdoor types, formal bulletins on bulletin boards, scrawls saying "Kilroy was here and worked safely" pasted on out-of-the-way places, or catchy messages cemented to shop aisleways.

Crew Cab Cards: Every truck having a "crew cab" is issued a card each month. Cards, placed inside the cab, are designed for each season, month, "D" day, or campaign.

Tailboard conferences: Construction crews are furnished discussion material for weekly tailboard sessions. Material may be pictorial (such as a poster) showing a right and wrong way to do a job; analysis of safety rules or instruction; review on safety actions, attitudes, and habits of people; or an accident report.

Projectors: One 2 x 2-in. slide projector has been altered so it can be used on a 6-v truck or car battery as well as one on 120 v. The cover has a built-in screen. This combination permits a safety advisor to hold meetings in the field, illustrating points with appropriate slides.

An "automatic" projector is also used. It holds 16 slides in a revolving disc inside the device. Each is projected automatically onto a built-in screen for 6 sec. The machine resembles a TV set. Slides are shown at traffic centers and before various employee groups.

Awards: Four achievement awards are issued. One is for small groups, three to 12 men, when they go one or more years without a disabling injury. A second is for larger groups who work one or more years and 250,000 man-hours. The fourth requires 1,000,000 man-hours of non-disabling-injury work regardless of how long it takes to earn.

The small award is signed by the group's safety advisor. Other awards are signed by the superintendent of safety and the company president. This gives the group recognition and keeps the president informed of outstanding groups.

Whenever a man avoids severe injury or perhaps death or blindness by wearing a hard hat or safety goggles, we apply for membership in his name in the Turtle Club and Wise Owl Club.

Accident investigations: All accidents are investigated by the man's immediate supervisor and a report is forwarded to proper departments. In addition, certain accidents which could have been serious are investigated by a group of higher level supervisors, and a report is circulated to interested areas. When a serious accident occurs, a panel of department-head and manager-level supervisors investigates, writes the report and sends it to the proper vice-presidents. Recommendations are normally ordered by him.

These investigations have the two-fold purpose of "getting the facts" and distributing information, and impressing upon employees that the company "really means business."

Constant reminders: Pencils and drinking cups have safety slogans which are changed frequently. One or more safety news stories are referred to the employee magazine each month. In the safety office, a telephone message device automatically gives the current slogan, statistics, or describes serious accidents to anyone dialing the number.

Letters: After the end of each year, the superintendent of safety sends a letter to employees' homes reporting results of the previous year's safety program. Also, a letter is sent to each department head complimenting him on a good job, or gently chiding him when his accident record was not as good as it should have been.

Management meetings: Every second week, a luncheon meeting is held for approximately 100 top management people. The program is usually preceded by several 1-min announcements and sidelights on safety events of the previous two weeks.

Special campaigns: About once a year, a special drive or campaign is held. These are carried on with as much "hoop-la" as possible (flags, lapel buttons, etc.) to remind everyone of the never-ending need for safety.

Employee meetings: Safety meetings are held in all areas. Obviously, they are held less frequently in less hazardous areas. Occasionally, we arrange for a vice-president to speak for a few minutes. Also, we stress that these meetings are the department's, not ours, and that they should make the plans. The safety section is available to help but does not "carry the ball" except in special cases.

Safety advisors: Backbone of the program lies in the work done daily by ten safety advisors in the field, shop, or storeroom. They contact the men and foremen day after day, recommending corrections, inspecting job conditions, and holding meetings. They try to sell safety rather than force it (although they have the authority); to persuade rather than to tell people to work safely; to remind supervisors and leaders that accident prevention is their responsibility, as well as ours; and that we are there to help them, not dictate to them. We also stress that we are available on a 24-hr basis.

Safety policy committee: Probably the strongest influence in our program is exerted by the safety policy committee. This 11-man group consists of two vice presidents, four managers, two superintendents, an assistant treasurer, personnel manager, and superintendent of safety. They meet every three weeks to discuss safety policy matters, recent accidents, and proposed campaigns. This committee has the power to put into effect any policy decided upon.

Purpose of this entire program can be summed up by a statement made years ago by one of our top people: "And the end is that the workman shall live to enjoy the fruit of his labor; that his mother shall have the comfort of his arm in her age; that his wife shall not be an untimely widow; that his children shall have a father; and that cripples and helpless wrecks, who once were strong men, shall no longer be a by-product of industry."

Service-Drop Standards Simplify

- Louisiana P&L uses these tables to minimize changes and to provide adequate capacity for 2½ times initial load
- Their standards are also designed to limit voltage drop between pole and customer entrance to a maximum of 1%

H. L. DELONEY, Assistant Chief Engineer; **C. A. CAMPBELL**, Meter Supervisor, Louisiana Power & Light Co, New Orleans, La.

The accompanying tables—Louisiana Power & Light Co's new standards for service-drop cables, sockets, and meters—are simplifying the selection and application of service equipment. In addition, these standards are designed to:

1. Provide adequate capacity for 2-2½ times initial load.

2. Limit the voltage drop between pole and customer's entrance to a maximum of 1%.

3. Provide installations that are as trouble free as possible, and minimize later work caused by insufficient capacity and low voltage.

The standards cover all customer classes except large industrials. Table I shows how the customers are broken down into 14 groups, depending on load and phase. Table II gives load characteristics of each group, and Table III lists the specific cable, socket, and meter for each of the 14 groups.

To determine a customer's group, district personnel must find out what appliances and equipment are used. Then the group can be pinpointed on Table I. In some cases it is easier to estimate the customer's consumption based on approximation of his appliances and equipment, and his group is determined by reference to Table II.

Although 3-phase residential service is included in the standards, it is discouraged in favor of 1-phase for air conditioning. Single-phase equipment costs slightly more but can usually be justified by analyzing the extra wiring and more costly primary, secondary, meters, and transformers for 3-phase.

Commercial and industrial loads are difficult to classify jointly because of the wide variety of equipment and applications. Classifications in these tables are primarily for commercial loads, but limits of maximum demand apply to both.

LP&L employs these practices in line with its new standards:

- Pre-assembled cables having

Table I—Descriptions of Customer Groups

Single-Phase Residential and Farm

Group A	Residences, urban or farm, containing "basic equipment" of lights, refrigerator, attic or window fan, television, radio, washing machine, hand iron, and miscellaneous small appliances. Also includes all customers having loads of 2.5 kw or less.
Group B	Residences having basic equipment (Group A) plus one or more of the following: electric range, room cooler, clothes dryer, or water heater. Also includes Group A residences having such farm loads as milking equipment, motor-driven equipment, large pumps.
Group C	Group A residences having all-electric kitchen and laundry, above average lighting, and several room coolers or central air conditioning. This home is usually above average in size and value.
Group D	Super home, usually of large area, high value, and completely air conditioned. Also included are Group C farms having additional farm load.

Single-Phase Commercial

Group A	Small store with few lights, small refrigerated display counter, and miscellaneous small appliances.
Group B	Average grocery store, drug store, restaurant, or service station with fair lighting, small refrigeration load, fans, and miscellaneous appliances. Does not include air conditioning.
Group C	Average in size, good lighting, complete refrigeration, such as walk-in cooler and display counter, and up to 7½ or 10 tons of air conditioning.
Group D	Super market or shopping center with high light level, complete refrigeration, and air conditioning above 10 tons.

Three-Phase Residential and Farm

Group 1	Group B or C residences having 2 to 7.5 tons of 3-phase air conditioning or a Group A, B, or C farm having 3-phase equipment.
Group 2	Similar to Group 1 except the home is larger and has 10 tons or more of air conditioning.
Group 3	Super home having more of everything; estimated demand over 27 kw.

Three-Phase Commercial

Group 1	Typical grocery store, restaurant, small department store, or other business in commercial Group A but with 1 to 2 tons of air conditioning.
Group 2	Same as Group B but includes 3 to 15 tons of air conditioning.
Group 3	Super market and shopping center with complete air conditioning.

aluminum conductors are installed for services. Armored cable is used as tree cable.

• Duplex is used for 120-v service, below about 2 kw, where growth is unexpected. Such applications include traffic signals, sign lighting.

• Triplex is installed for all other 1-phase services and for replacing damaged 2-wire service drops if cable can be terminated at a socket. Where used for 2-wire load, the cable and meter socket are connected for 120/240 v if 3-wire secondary is available. Otherwise, one conductor is not connected at the pole and meter socket.

• Quadruplex is installed for 3-phase services.

Temporary services for construction purposes are, wherever possible, installed in such place and length to permit re-use in connecting the completed building.

Standards for minimum size conduits between service head and socket or enclosure have been set up to minimize the need for rebuilding the service entrance for increased capacity. The correct conduit size is the one that matches the diameter of socket hub (Table III).

Various Standards Apply

Rigid steel conduit must be installed for service masts. But electrical metallic tubing and fittings, approved by National Electrical Code for outdoor use, may be used where mechanical strength is not a primary consideration.

Single-phase sockets are supplied with 1¼ and 2-in. hubs, the latter for use on any building with 2-in. rigid steel conduit for a service mast. Assemblies of two or more sockets are available for multiple occupancy buildings.

Three-phase sockets are used on residential and farm buildings where demands are not measured, but meter enclosures are required if both energy and demands are measured. A special duplex connector is used on 3-phase test blocks if a second enclosure or socket is to be banked with the original and a second service cable will not be installed.

Table II—Load Characteristics of Groups

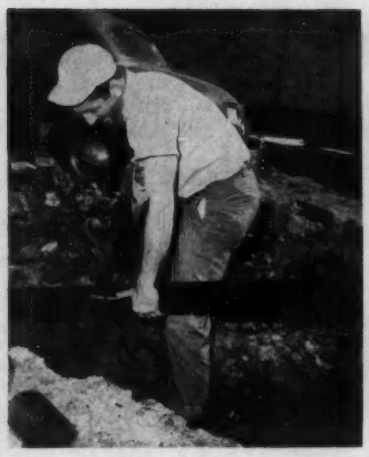
Group	Initial Max. Kw	Amperes	Annual Kwhr	Summer Kwhr Mo	Winter Kwhr Mo
			Single Phase		
A–Res	Up to 2.5	Up to 20	Up to 3,200	Up to 360	Up to 180
B–Res	2.5–9.0	20–60	3,200–13,000	360–1,500	180–725
C–Res	9.0–18.0	60–120	13,000–27,500	1,550–3,000	725–1,500
D–Res	Over 18.0	Over 120	Over 27,500	Over 3,000	Over 1,500
A–Com	Up to 2.5	Up to 20	Up to 6,500	Up to 725	Up to 360
B–Com	2.5–9.0	20–60	6,500–23,500	725–2,600	360–1,300
C–Com	9.0–18.0	60–120	23,500–50,000	2,600–5,500	1,300–2,750
D–Com	Over 18.0	Over 120	Over 50,000	Over 5,500	Over 2,750
			Three-Phase		
1–Res	Up to 15.0	Up to 65	Up to 22,000	Up to 2,600	Up to 1,200
2–Res	15.0–27.0	65–120	22,000–40,000	2,600–4,700	1,200–2,200
3–Res	Over 27.0	Over 120	Over 40,000	Over 4,700	Over 2,200
1–Com	Up to 6.0	Up to 30	Up to 17,000	Up to 2,000	Up to 1,000
2–Com	6.0–20.0	30–75	17,000–52,000	2,000–7,000	1,000–3,000
3–Com	Over 20.0	Over 75	Over 52,000	Over 7,000	Over 3,000

Table III—Service Equipment Required for Groups

Group	Cable	Socket or Enclosure	Meter[1]
		Single-Phase	
A–Res	4 3W Al	Regular socket: 1¼ or 2-in. hub	15 amp (60) kwhr
B–Res	1/0 3W Al	Reg or large socket[2]: 1¼ or 2-in. hub	15 amp (100) kwhr
C–Res	4/0[4] 3W Al	Heavy-duty socket[3]: 2 or 2½-in. hub	50 amp (200) kwhr
D–Res	4/0 3W Al	Requires current transformers	TR meter kwhr
A–Com	4 3W Al	Regular socket: 1¼ or 2-in. hub	15 amp kwhr & kw
B–Com	1/0 3W Al	Reg or large socket: 1¼ or 2-in. hub	15 amp kwhr & kw
C–Com	4/0 3W Al	Heavy-duty socket: 2 or 2½-in. hub	50 amp kwhr & kw
D–Com	4/0 3W Al	Requires current transformers	TR meter kwhr & kw
		Three Phase	
1–Res	1/0 4W Al	Medium-duty socket: 2-in. hub	15 or 50 amp kwhr
2–Res	4/0 4W Al	Heavy-duty socket: 2½-in. hub	50 amp kwhr
3–Res	4/0 4W Al	Requires current transformers	TR meter kwhr
1–Com	4 4W Al	Enclosure 101022 or 101426: 2-in. hub	15 amp kwhr & kw
2–Com	1/0 4W Al	Enclosure 101426: 2-in. hub	50 amp kwhr & kw
3–Com	4/0 4W Al	Requires current transformers	TR meter kwhr & kw

[1] In meter column, figure in parenthesis indicates maximum capacity of meters.
[2] Large socket is available for use with No. 1/0 3-wire armored cable (tree cable).
[3] Heavy-duty socket will carry 200 amp without over-heating and has by-pass facilities.
[4] No. 4/0 aluminum will carry approximately 190–200 amp. It has been assumed that this class of customer will be served through no more than one span of No. 2 copper or equivalent secondary.
[5] When two or more customers are supplied via a single service drop, the cable will be No. 1/0 or larger.

Flexible plastic pipe . . .



easily cut in trench . . .

and spliced with cement . .

Makes UG Distribution Easier

Butyrate plastic pipe reduces the cost of installing underground conduit for low-voltage circuits of New Orleans Public Service, Inc. Use of the pipe cuts installed costs by simplifying handling and fabrication in the field.

In the past four years NOPSI has used 2.3 miles of the plastic pipe for services, residential distribution, street lighting, and the repair of broken conduit—all low-voltage applications.

The company has found that the pipe, which is extruded of butyrate plastic, has special characteristics that facilitate field fabrication and handling. These features include flexibility, ease of cutting and splicing, smoothness, and light weight.

Two Sizes Are Used

NOPSI uses two sizes of pipe: (1) 3-in. ID with 0.125-in. wall thickness for services up to 250 amp, and (2) 4-in. pipe with 0.15-in. wall for 3-phase services up to 400 amp and for residential distribution circuits up to 600 amp. Under driveways and roads, where traffic is heavy, the pipe is encased in concrete. Elsewhere it is protected only by earth backfill.

The pipe's semi-flexibility reduces the need for careful trench shaping and often permits by-passing of obstructions in the trench. The utility has found that offsets up to 4 ft can be made without undue strain in a 20-ft length of 4-in. pipe, and 6-ft offsets in a 3-in. pipe. Greater deflections are not recommended because they might distort the cross section of the pipe. Bends of 90 deg, however, are made with sweep elbows.

Flexibility also makes it possible to avoid continuous trenching in some locations. For shallow runs under concrete or similar surfacing the pipe can be fed into tunnels through 2 or 3-ft sections of open trench.

Because the pipe is easy to cut and splice, special bends for by-passing obstructions can be fabricated in the field. The pipe is cut with an ordinary hand saw used for woodworking. It is spliced by painting a solvent cement on both ends and butting them inside a coupling with a sleeve slipped over the cemented pipe ends.

Normally, butyrate pipes are cut and spliced in the ditch. At times, however, lengths are joined above ground and fed into a undermine.

Inside of the pipe and joints is smooth. This feature eliminates the possibility of snagging or damaging cable curing pulling operations. In addition, the pipe is light enough to permit one man to carry several lengths of the standard 20-ft size.

NOPSI crews have developed a technique for joining the pipe to rigid conduit on the customer's premises. A slip-sleeve is cemented to the end of the butyrate elbow which brings the service into vertical position above ground. The sleeve is heated with a blow torch and stretched over the terminal nipple. Cooling contracts the sleeve to a tight fit.

Also Serves for Conduit Repairs

The company is also using this pipe to repair breaks in conduit without splicing the cable. First, the damaged section of conduit is removed. Second, a butyrate sleeve, formed by cutting a piece of pipe lengthwise, is fitted over the ends of the conduit. Third, concrete is poured around the repaired section.

The New Orleans utility has had good operating experience with the plastic pipe. Because there have been no cable faults the company has had no field test of its heat conductivity and combustion. For this reason the pipe is used only for low-voltage circuits.

NOPSI's experience shows that butyrate resists external attack by decayed vegetation, corrosive soils, or high-water table.

A Special Report

SECOND ANNUAL REPORT ON NUCLEAR POWER

This is the year of realism in the A-power industry. It is a year when cost estimates of proposed plants rose sharply—some coming close to twice the original figure. These second thoughts about costs are a reflection of the many complicated problems facing nuclear power plant designers. They disperse any blue-sky thought of an immediate nuclear power revolution. But realism isn't synonymous with pessimism. Progress has been made this year. This special report summarizes some of this progress and calls attention to problems yet to be solved.

A-Problems Many, But Solutions Probable

Evaluation is realistic but not pessimistic.....p 94

Argonne Reactor Operates Successfully

Four months' operation indicates sound design...p 98

Radiation Problems Will Be Solved

Strict plant safety program is basic solution.....p 101

Tabular Summary of A-Plant Progress

One plant producing power, 3 more slated for 1957 operation .....p 104

A-Problems

Evaluation of nuclear power reactors indicates that:

- **Several power reactors must be built before all problems are defined**
- **Long, difficult development period still required**
- **Nuclear fuel costs will be high initially**
- **Thermal efficiency must be improved**

SHIPPINGPORT nuclear power plant indicates the change in power plant layout and design requirements that will be necessary in the coming atomic age

JAMES K. PICKARD, Pickard-Warren-Lowe Associates, Washington, D. C.

Outstanding among the characteristics of nuclear energy is the difficulty of viewing its great potentialities in a perspective which recognizes problems still to be overcome.

The actual and potential influence of nuclear energy is truly great. As a prospective source of electric power it has stirred up widespread speculation in the press and among political leaders around the world. Its "glorification" has led many people to believe that its promise can be realized easily.

Two Factors To Appraise

Until recently, little general recognition was given to the amount of plain, hard work of a non-nuclear—hence unromantic—nature needed to make applications for electric power generation practical and economic. The production of energy from the atom differs from that of conventional fuels in two major aspects, which the utility executive—who is eventually responsible for deciding when and how to enter the nuclear field—must consider.

First, there are non-technical factors having an important bearing on such decisions because of their effect on the direction and speed of developing atomic power. These include the domestic public-vs-private power legislative controversy, recent pressure for rapid development to —according to some—maintain our international prestige, and to recognize Western Europe's new incentive for substituting uranium and thorium fuels for the oil it may not be able to count on.

These factors may influence the acceleration of nuclear power developments here and abroad before the technical problems have been dealt with in the orderly succession of research and testing stages characteristic of industrial evolution. Other non-technical and important factors include legal, financial, transportation, and insurance problems, all having complications unique to nuclear power.

The utility executive must also consider the variety and difficulty of the many engineering development problems to be solved. The early optimism, based on preliminary laboratory studies indicating the great eventual potentialities of the atom is now giving way to a more realistic approach. The emergence of this realism is due to the rising construction costs on projects underway, and the large engineering and development costs of those doing the pioneering.

The recognition of these problems has revealed the immense gap between laboratory experiments and ultimate construction and operation of a practical, full-scale atomic power plant. This gap, in conventional power plant technology, has been bridged over a long period in time, and in such a way that a whole complex of industrial and engineering concerns has become adept at perfecting new equipment and adaptations of a highly developed technology.

The development of nuclear power requires, not small modifications of estabilshed technology, but a completely new one. A few pioneers, whether industrial or governmental, without help of complementary experts, such as financiers, engineers, etc., will probably not bring this about; the effort must be an integrated one. To develop an educated and integrated approach will take years.

Problems Are Unique

In considering the realities of nuclear power plants, utility management should be aware of the unique problems associated with such power generation. Engineering executives should consider the following facts about nuclear technology today:

1. Adequate handling of very dangerous materials is necessary. The most significant problems in this regard stem from the fact that small amounts of radiation are harmful. For instance, a 100-Mw (electric) nuclear power plant burns approximately 1 lb of nuclear fuel every day, and produces approximately 1 lb of highly radioactive fission products. These products must be controlled in such a fashion that much less than a trillionth

Many, But Solutions Probable

(10^{-12}) of their radiation enters space occupied by man.

2. Improving fuel utilization is necessary. With present technology, fuel must be changed in the reactor core when only one-tenth to 1% of the uranium has been burned. This means that the theoretical energy concentration of the nuclear fuel (2½ million times as much energy in 1 lb of uranium as in a lb of coal) is reduced to between 2,500 and 25,000 to one, as compared with hydrocarbon fuels.

This is still a high energy concentration, and the fuel can, of course, be further utilized by processing spent fuel elements and returning the recovered fuel to the reactor. But this processing is complicated and expensive, and it is not yet clear whether improved fuel utilization will come through longer residence time in the reactor, less expensive processing, or a combination of these.

3. Lowering nuclear fuel heat rate is necessary. Although, theoretically, very high temperatures are available from nuclear fission, with current technology it is not practical to operate nuclear fuels above 600F, and after transferring the heat through one or two heat exchangers, the overall efficiency is low.

4. Further equipment development is necessary. There is much yet to be done to develop, engineer, and manufacture equipment, such as pressure vessels, pumps, valves, heat exchangers, and instruments, that are economic and technically capable of handling radioactive materials.

Because the political and competitive pressures are currently great, there is need to accelerate the development of nuclear power. This

Nuclear Vs Conventional Plants

There are many different types of reactors to consider for possible power plant use. Two of the most advanced types, the pressurized and boiling water types, have been committed to full-scale plant construction. If these types of reactor plants are considered, the significant differences between their construction and operation and those of a conventional power plant might be summarized as follows:

1. Unique features relating to plant costs:
- a) Location and development of a remote site.
- b) Facilities for vapor and missile containment.
- c) Massive radiation shielding.
- d) Facilities and equipment for waste handling, treating, and disposing.
- e) Special equipment and facilities for radiation monitoring.
- f) Special equipment for obtaining high purity.
- g) Special canals, and tools and equipment for fuel handling.
- h) Very detailed and difficult manufacturing and testing specifications for major pieces of reactor equipment.
- i) High cost of equipment, reflecting experimental and developmental costs.

2. Unique features of fuel costs
- a) Dependence on AEC for fuel supply.
- b) Dependence on limited resources, including AEC, for fuel processing.
- c) Many varied and complicated processing steps required.
- d) One to three years' fuel supply handled at one time, requiring special financing.
- e) Strong likelihood of design changes in fuel composition and form.
- f) Special procedures for handling highly radioactive irradiated fuels.

3. Unique features relating to operation
- a) Peculiarities of reactor operation regarding start-up, shut-down and load change characteristics.
- b) Routine, special and/or accidental waste handling, processing, and disposing.
- c) On-site and off-site radiation monitoring.
- d) Special procedures for handling various kinds of accidents or special operating conditions.
- e) Operation of special auxiliary systems for maintaining coolant purity, gas blankets, etc.
- f) Operation of low-pressure turbine.
- g) Fuel handling and consumption calculations involving reloading and rearranging schedules.
- h) Operation of many sensitive mechanical and electronic devices.

4. Unique features relating to maintenance
- a) Remote or semi-remote maintenance operations requiring special tools, equipment, clothing, and skills.
- b) Careful monitoring of all radioactive maintenance operations.
- c) Detailed procedures for flushing, cleaning, and ventilating equipment facilities during maintenance.
- d) Carefully planned preventive maintenance.

5. Miscellaneous unique features
- a) Governmental regulations involving facility and operator's licensing, hazard and safety reviews, and fuel accountability.
- b) Governmental policies and services regarding the supply of fuel.
- c) Governmental security considerations.
- d) Public relations regarding plant location and operation.
- e) Personnel training of reactor operators, maintenance personnel, etc.
- f) Plant insurance—principally third party liability.

can be done, but probably at high cost and with considerable warping of the industrial complex. Under such conditions, we must be prepared for failures and inefficiences, simply because insufficient time is allowed to digest and interpret the results of experimentation and to proceed in an orderly manner.

A slower and more conservative approach would provide time for operating experience to be obtained from an experimental plant and analyzed before proceeding with construction.

The table on the preceding page illustrates the complexity of the problems of selecting a nuclear power plant. It points up the many differences between nuclear and conventional power plants.

Fuel Costs Are Significant

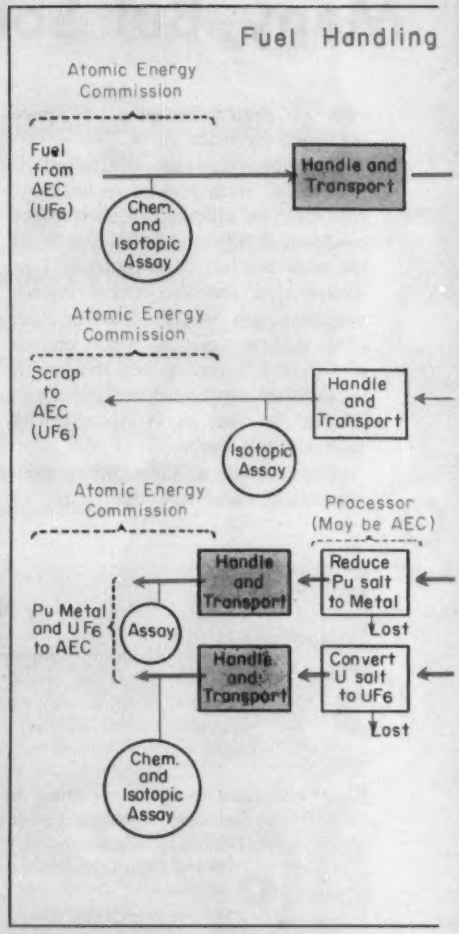
To identify all such differences, it is necessary to maintain a continuing consideration of the overall activities involved in designing, building, and operating a nuclear plant. In practice, it would be particularly important for the operating utility to arrange for an independent evaluation of the overall activity, as architect-engineers evaluate conventional plants, to insure that: **(a)** plant estimates are complete and checked; **(b)** fuel cycle and operating costs are adequately accounted for; **(c)** safety and hazard studies are carried out; **(d)** local and federal regulations and licensing provisions are satisfied; and **(e)** the plant design is optimized insofar as the accuracy of the information will permit.

Because the much publicized potentialities of nuclear power are due to its theoretically great energy concentration, it has been assumed that nuclear fuel costs would be very small, if not negligible. There is reason to hope that this may ultimately be the case and that the high capital cost of nuclear plants can be offset essentially by their low fuel cost. It is therefore desirable to review the nuclear fuel supply picture.

As an example of the many steps and processes in supplying and handling nuclear fuels, a typical case involving either a pressurized or boiling-water type of reactor with metal-clad solid uranium oxide fuel elements has been considered. Admittedly, these reactors have a low thermal efficiency. Yet they are the only types sufficiently developed to justify full-scale construction. The flow chart at the right illustrates the processing steps in supplying and handling such fuel.

The chart illustrates a simplified case in which slightly enriched uranium of uniform enrichment is acquired from the Atomic Energy Commission, sent through fabrication to the reactor, and from the reactor through radio-chemical processing, and returned to the AEC. Obviously, a more complicated flow chart would be required for reactors containing two or more types of fuel materials, such as uranium and thorium, or highly enriched as well as slightly enriched uranium in the form of blankets or seeding. The chart would be complicated also if the fuels recovered by the chemical separation plant were recycled—fed back into the fabrication plant to return to the reactor.

To determine costs of handling fuel through these steps, data must be obtained regarding fuel specifications, batch size, frequency of processing, type and form of cladding, etc. Once these data are obtained, it is necessary to find firms or government organizations prepared to carry out the processing or handling steps, and, when possible, to secure cost estimates.



FUEL HANDLING CYCLE indicates the many

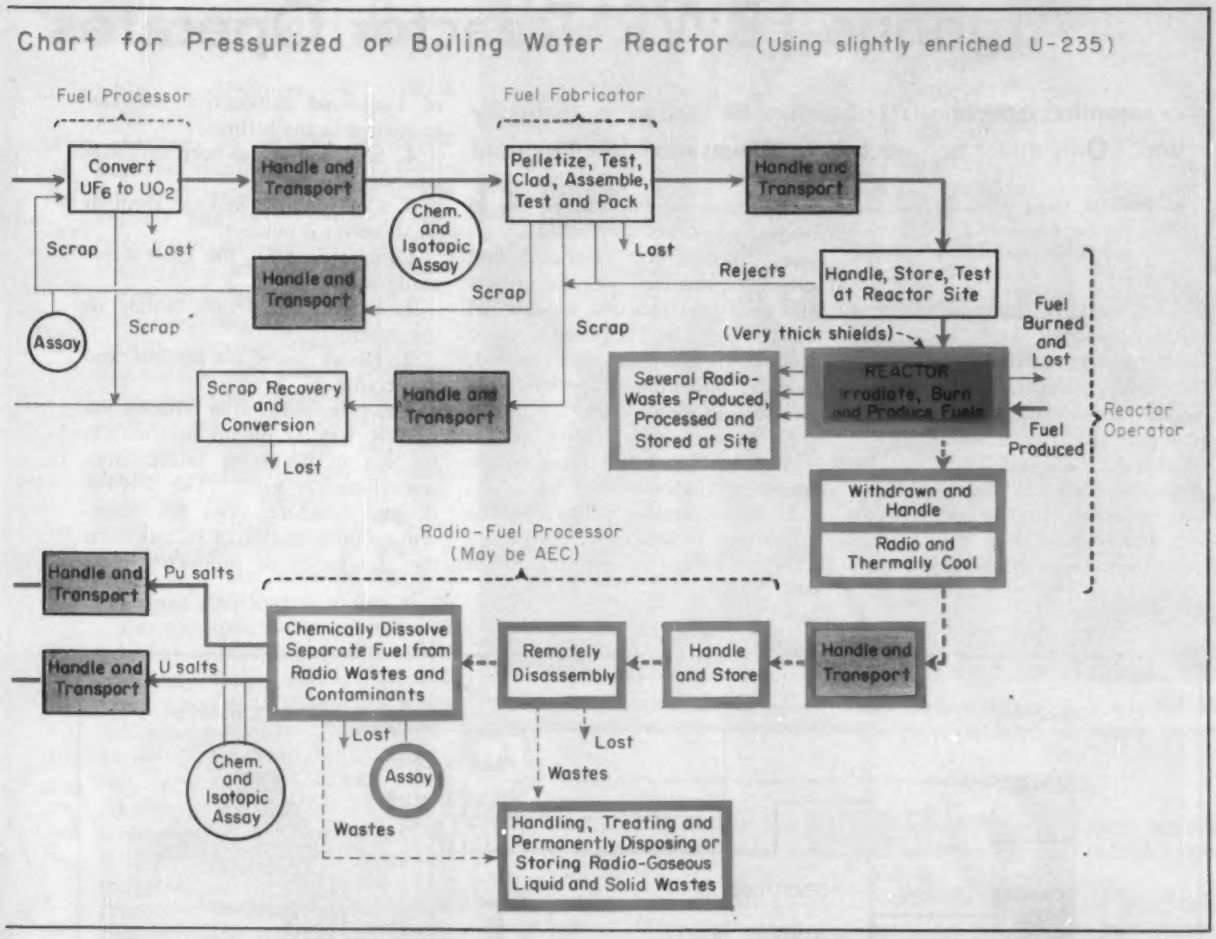
Today very few non-governmental organizations are prepared to undertake this work. Perhaps only one or two are prepared to convert uranium hexafluoride to uranium oxide; perhaps half a dozen have announced their intention of making fuel elements; none are prepared to handle what appears to be the most difficult step—chemical processing. And none are equipped to handle the final conversion of the plutonium and uranium salts to the required metal or other forms. It is therefore necessary, in obtaining estimates of fuel costs, to assume that AEC facilities will be available for some of the processing.

Typical overall fuel costs for a medium-sized plant, using slightly enriched stainless steel clad uranium oxide fuel elements, might be as shown in Table I.

The first core costs are those

Table 1—Estimated Fuel Costs

	First Core Costs (mills/kwhr)	Subsequent Core Operation (mills/kwhr)
Cold processing and fabrication	2.8	0.8
Net burn-up cost	1.5	1.5
Radioactive processing and handling	0.8	0.5
Total carrying charges	1.5	1.0
Total	6.6	3.8



new procedures that use of nuclear fuel will require. Radioactivity, among other things, will make the procedures expensive

which might be experienced were a nuclear plant built and operated today without further development of technology. It reflects the yet undeveloped state of the reactor, fuel fabricating, and processing operations. Fuel costs for subsequent cores, as noted, are expected to be lowered significantly. This will be due to lowered unit costs through quantity production, higher burnups, and improved processing.

There is hope, of course, that the fuel costs for pressurized or boiling-water types of reactor will eventually be less than those given for subsequent core operation. But certain rather basic considerations make this improbable.

Because one to three years supply of expensive nuclear fuel (10 to 30 tons of partially enriched uranium) may be processed in one batch, the batch's value may be high ($5 to $25 million), requiring special and complicated procedures for assaying and accounting for all materials in processing, in wastes, etc. Critical size considerations limit the amount of material handled at one time to a few hundred pounds.

Precautions Are Necessary

Extreme precaution must be exercised in treating and disposing of fission wastes. Waste costs today account for about half the radiochemical processing costs, The radio-chemical processing costs are themselves based on recently published AEC schedules and may reflect low rather than high values. It is also necessary, because of the slightly hazardous nature of the raw materials, to monitor the cold processing and fabrication activities for personnel protection.

Considerations of nuclear fuel costs may be summarized as follows:

1. The costs of nuclear fuel for pressurized or boiling water reactors are relatively high. While there is hope that they may eventually be reduced significantly, it does not appear reasonable to assume that these costs will be much below 3½ mills per kwhr within several years.

2. This fact stresses the importance of improving the thermal efficiency of the nuclear reactor. It also stresses the importance of further developing fuel handling and processing equipment and techniques of processing fuel.

3. While reductions in the costs of many of the fuel processing steps, as now visualized, seem probable, there are basic limitations to such reductions.

4. The AEC, both as a supplier and processor, will play an important role in establishing fuel costs.

Argonne EBWR Reactor Operates

Four months' operations indicate that design is basically sound. Only minor non-nuclear problems have been evident

L. W. FROMM, Head, Water Reactor Section, Reactor Engineering Division, Argonne National Laboratory, Lemont, Ill.

The Western Hemisphere's first nuclear reactor, built exclusively for the generation of electric power, the 5-Mw Experimental Boiling Water Reactor (EBWR), has by now produced over 2,000,000 kwhr of power. Designed and built by Argonne National Laboratory, it was formally placed in operation on Feb 9 (EW, Feb 25, p 40). The reactor operates as indicated in Fig. 1.

Operation of the reactor has so far proved to be very satisfactory. And although the engineers and scientists connected with the project believe a considerable amount of testing will be required before definite conclusions are reached, enough operating experience is available to indicate that:

1. Steam bypass control system is very useful in maintaining proper operating conditions.

2. Self-regulating feature of the reactor has proved satisfactory.

3. No carryover and deposition of long-lived radioactive material is evident in the turbine.

4. Shaft seals have been very satisfactory.

5. Considerable leakage through small valves is evident.

Future plans for the EBWR include use of:

1. Forced circulation boiling in the reactor.

2. Heavy water for coolant and moderator.

The principal goal in building the EBWR was to obtain information for use in designing future large central-station units. The EBWR design, therefore, does not represent an optimization of factors from the standpoint of producing elec-

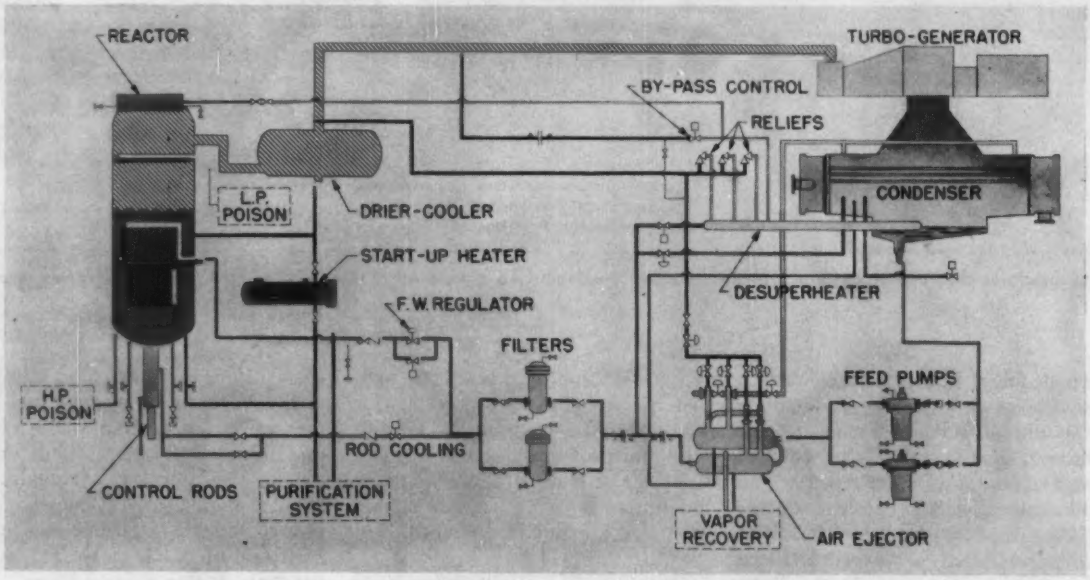


Fig 1—EBWR Primary System Flow Diagram

The EBWR is a 5-Mw electrical capacity plant employing a direct steam cycle. Saturated steam is generated at 600 psig and 486F by natural-circulation boiling of water in the reactor and is passed through a steam dryer directly to the turbine without intermediate heat exchange. The steam dryer, equipped with cooling coils, may serve as an emergency cooler. Steam in excess of that demanded by the turbine in response to generator load is bypassed through a desuperheater directly to the condenser. This bypass system maintains a constant pressure in the reactor vessel.

Vacuum is maintained in the condenser by an air ejector system fed by steam from the dryer. The turbine discharges steam directly to the condenser. Condensate is returned to the reactor at 110F by combination condensate and feedwater pumps.

Water purity is maintained by ion exchangers and filters. Water is removed from the bottom of the reactor vessel, passed through the ion exchangers, and returned with the feed water.

A vapor recovery system collects any water vapor carried over by the air ejectors and any leakage through seals of the turbine, pumps, and valves. This water is returned to the condenser. The vapor recovery system is now used to prevent radioactive contamination. It will also have economic value when heavy water is used.

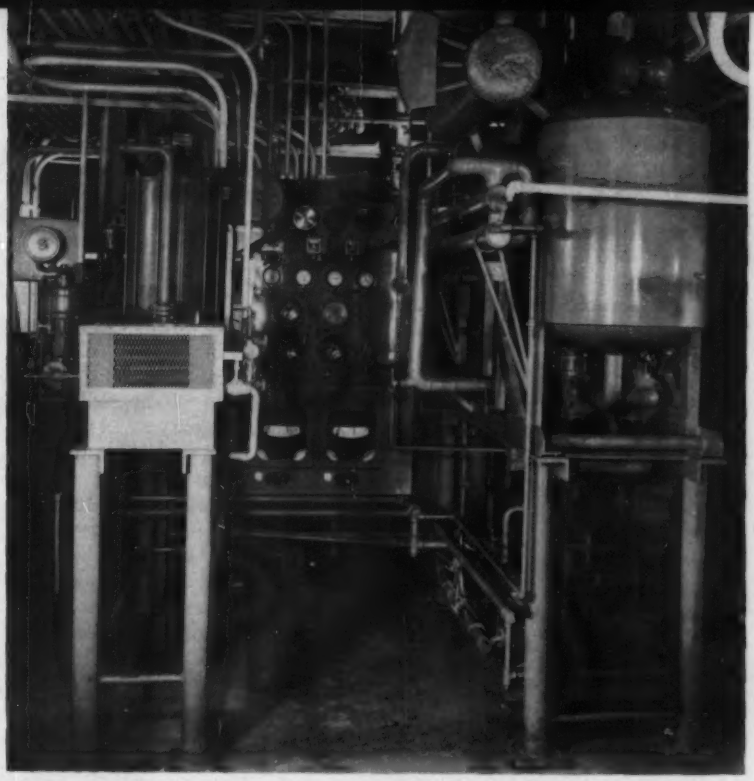
Successfully

tricity at minimum cost from a 5-Mw plant.

Instead, an unusual degree of flexibility was incorporated to facilitate investigation of the basic unknowns and uncertainties in the boiling water reactor concept. Prominent among these uncertainties are reactivity feedback in control, corrosion, erosion, and radioactivity carryover, coolant leakage, and water quality control problems.

As might be expected, the complete experimental investigation will take considerable time, and only general observations may be made regarding the operation to date. Some information will not become available until certain portions of the system are disassembled and examined after long-term operation.

For example, steam generated in a boiling reactor is somewhat more corrosive than ordinary steam. Small amounts of the reactor water are dissociated into hydrogen and oxygen by nuclear bombardment, and these gases are carried off in the steam. Vital parts of the EBWR turbine, as well as the interior of the main steam piping, were nickel plated by the Kanigen process as a preventive measure against excessive corrosion by this oxygenated steam. A true evaluation of the corrosion and erosion cannot be made until the turbine casing is opened and the interior examined.



PRESENTLY DESIGNED air drying and fluid recovery system uses recycled air supply. Future designs will not use this recycling type air supply system

Operation Satisfactory

On the other hand, as previously enumerated, a number of important points of information have been gained from operation of the plant thus far. The steam bypass control system, for example, has proved to be a very useful tool in assisting the reactor operator in maintaining proper operating conditions.

The reactor is normally operated at constant power and total steam flow rate. To minimize the regulation of reactor power with fluctuations in electric power demands, all excess power is removed as steam bypassed directly to the condenser. The steam bypass valve can be set for automatic control. With a fixed steam flow, an increase in generator load automatically causes a diversion of more steam to the turbine. When the load is decreased, the bypass valve automatically directs excess steam to the condenser. The control system operates over a pressure range of 100 to 600 psig.

The original specifications for design of the steam bypass valve were very exacting as to accuracy of positioning and speed of response. Plans called for this valve to function as an absolute mechanical inverse to turbine steam demand, so that changes in the latter, resulting from load fluctuations, would be exactly compensated for by the bypass valve and no variation in reactor steam pressure would occur.

These specifications were necessarily relaxed because of manufacturing difficulties, and it now appears that the positioning of the bypass valve is only accurate to within 20% of the proper value for exact load compensation. This variation is reflected in fluctuations in reactor steam pressure.

But other adjustments were made in the plant control system to minimize this effect and permit effective operation of the reactor regardlessly. One adjustment was the narrowing of the proportional band of the reactor pressure controller to provide more rapid compensation for the error, in the form of feedwater flow control.

Another specification originally stated for the steam bypass control system was the ability to follow transients as rapid as 20 psi per sec in pressure fluctuation and to position the bypass valve continuously through such a change. It has been found that to maintain stability of the servomechanism circuits involved, this sensitivity has had to be reduced by a factor of four. However, even in this condition the system has served admirably well its principal function of arresting transients before high neutron flux trip values are reached and emergency shutdowns (scrams) occur. It has therefore become apparent that in a future installation the bypass system could be designed and built more simply, to considerably less rigid requirements, with attendant saving in cost.

The self-regulation feature of the boiling water reactors, wherein minor variations in nuclear conditions are automatically self-compensated by changes in steam void content, has worked out particularly well in EBWR. The reactor has

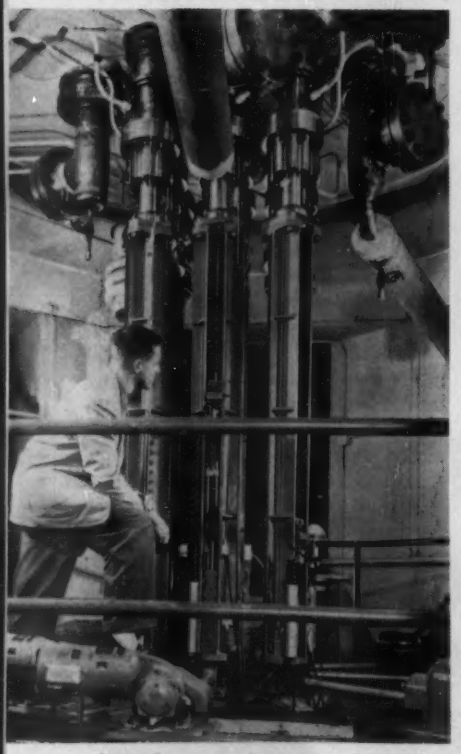
proved to be more stable in operation than its predecessors, the Borax reactors.

With the reactor at full power, radioactivity levels of 200 mr per hr at the steam dryer and 20 mr per hr at the turbine have been observed. No special shielding is employed around these units, so that the activity levels are attenuated from the interior values only by the steel forming the dryer tank wall or the turbine casing. So far as can be measured now, these activities originate almost completely in the very short-lived nitrogen-16 isotope formed in the reactor by neutron bombardment of the oxygen in the water and steam.

The decay of the radioactive nitrogen-16 to normal oxygen-16 leaves no contamination of exposed surfaces. No carryover and deposition of long-lived radioactive particulate material, such as products of corrosion, has been detected, because the activity of the turbine drops to below background levels shortly after reactor shutdown and cessation of steam flow.

The operation of the air and steam-buffered rotating shaft seals in the turbine, feedwater pumps, and large valves has been very satisfactory. No outleakage of coolant water, and no unusually large flows of contained leakage to the fluid recovery system have been noted.

However, one feature of the system needs revision. As now designed, the recovery system dries air and feeds it to the seals. A portion of the air fed leaks inward to a low-pressure section of the seal where it mixes with primary water or steam leaking out. The remaining air leaks outward to the building atmosphere. The air-water mixture (combined in and out-leakage) is passed to the recovery system, where the water is extracted and returned to the reactor system and the air is dried and recycled to the seals.



ONLY MINOR sticking of the control rod drive mechanisms has been experienced

Some Leakage Encountered

As the result of slight contamination of some fuel assemblies with uranium particles during a pre-operational corrosion test, some radioactive xenon, a fission product, is present in the primary system water and steam. Some of this xenon is carried with the collected water leakage through the seals to the recovery system. There it is extracted with the air and remains with the air recycled to the seals. A portion of the xenon then leaks outward to the building atmosphere and causes some air contamination. This contamination may be eliminated by designing future systems for 100% fresh air feed to the seals, without air recycle.

Considerable difficulty with leakage through small valves has been experienced. This has not constituted a serious problem with light water operation. Yet the contemplated future tests with heavy water will necessitate redesign or replacement of these valves to avoid the heavy water loss which would result.

The linear shaft seal external lead screw and nut control rod drive mechanisms mounted below the reactor vessel have performed in a very satisfactory manner. Some minor sticking has been experienced on a few occasions, but the accessibility of the mechanisms for maintenance has permitted very rapid and easy rectification. The ability of the mechanisms to be removed completely and replaced without draining the reactor vessel has been demonstrated several times.

Planned experiments include an investigation to determine the maximum power density which can be reached at various operating pressures before instabilities are observed or the full reactor power of 20-Mw can no longer be reached.

This program will be carried out by reducing the size of the reactor core while maintaining the same maximum power, in order to avoid the need for additional power dissipation equipment. Present indications are that considerably higher powers than the design maximum could be reached with the present reactor before encountering instability.

Later this year modifications will be made to permit investigation of forced circulation boiling in the reactor. General boiling reactor studies carried out by the laboratory staff during the past three years indicate that large gains in specific power might be achieved by forced circulation within the core. A forced circulation system has been designed which, with the present core, may deliver 50% more power at the same steam void fraction as is present in the 20-Mw natural circulation operation. It may be feasible to increase the steam void fraction and thus obtain a total reactor power output much larger than the present 20 Mw.

The more significant aspects of forced circulation will be realized in operation with a smaller core diameter. By increasing the coolant velocity by a factor of at least 4, and with an average steam void fraction in excess of 20%, the reactor power density could be increased possibly five-fold over the present value. At such high power densities, the limitation on reactor power should no longer be the boiling stability, but rather the established heat flux limitations on the present fuel elements. A small core may be installed in the EBWR sometime in the future to investigate such effects.

Definite plants have been made to test a heavy-water core in the EBWR early in 1958. This core will be designed to operate primarily with forced circulation. Fuel elements of a new design which should be much lower in cost than those in the first EBWR core are being considered for the heavy water core.

What will be the impact of radiation on the utility industry?

It will mean . . .

1. **Plant layout and design somewhat more complex than for conventional plant.**
2. **Compliance with additional codes and regulations.**
3. **Institution of programs of radiation surveying and personnel monitoring.**
4. **Establishing acceptable radiation control procedures.**
5. **New educational program for plant personnel.**
6. **Use of specialized instrumentation and trained personnel.**
7. **Compilation of pertinent records of radiation handling.**

Radiation Problems Will Be Solved

R. G. CAMPBELL, Industrial Hygienist,
A. E. VOYSEY, Consulting Engineer,
N. E. GORDON, Supervisor Technical Operations, Atomic Power Dept, Westinghouse Electric Corp, East Pittsburgh, Pa.

The use of nuclear power for the generation of electricity thrusts problems of radiation protection upon the utility industry. The initial impact will be in plant safety programs—requiring strict adherence to prescribed proceduces for such protection and additional expense for establishing and implementing the programs (see box above). But experience will relegate this concomitant of the nuclear power plant to the status of other hazards of the industry today.

Safety Record Remarkable

The remarkable safety records of atomic energy installation have proved that radiation protection presents no insurmountable probblems, and the electric utility industry will benefit from this experience.

Rough estimate of the initial cost of radiation protection considerations, based on a small reactor plant and currently employed instrumentation, techniques, and requirements, would range from $20,000 to $40,000 per year. Reductions can be anticipated as techniques become routinized and the unfamiliarity of radiation protection measures is removed. This estimate includes survey instrumentation, personnel monitoring, radiation protection, personnel, etc., but not permanent shielding, waste disposal systems, and similar features. The latter are plant design considerations rightly included in the plant capital expenditures.

The character of the radiation problem lies in the fact that in handling radiations and radioactive materials, personnel and environment must be protected from uncontrolled exposure by a close control of the radioactive materials and radiations themselves. The situation is complicated by the facts that radiation is not detected by the physical senses, and that time must always elapse between exposure to excessive radiation and the appearance of its effects. Consequently, it is essential that appropriate instrumentation be available so that there is no possibility of radiation dosage approaching proportions harmful to operating personnel.

Plant Layout Affected

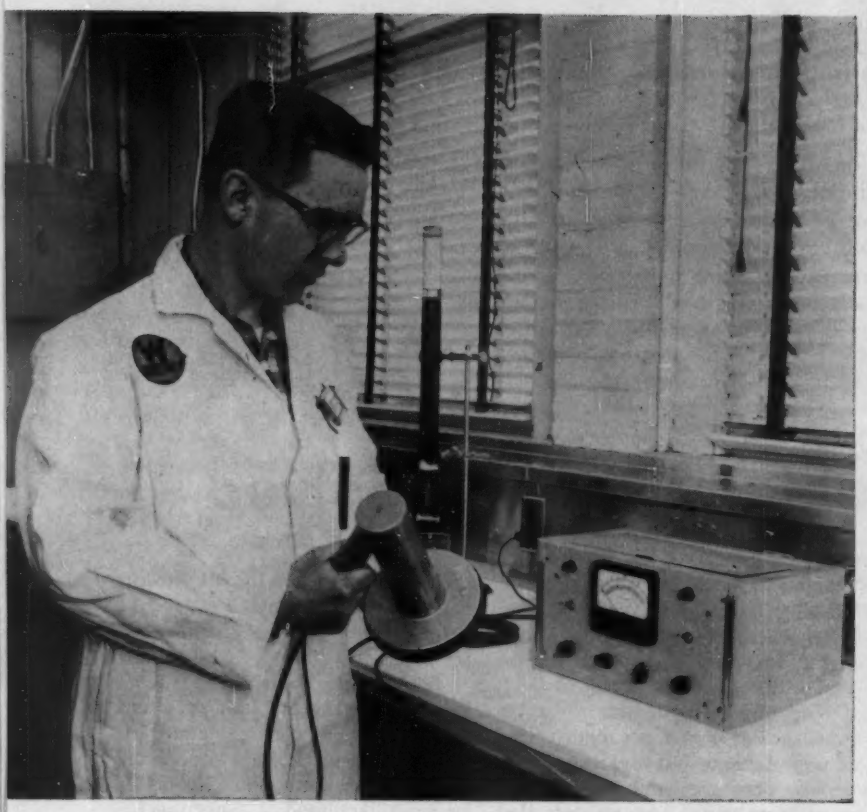
Concern for the effect of radiation must be considered as early as the initial concept of the plant. The design and layout of the reactor plant must incorporate more extensive protective measures than those of the conventional plant. Adequate shielding must enclose the reactor and reactor auxiliary equipment to reduce radiation levels. Remotely controlled machinery must enable the operator to refuel the reactor, position control rods, operate valves, pumps, and motors on the reactor main coolant system, and perhaps substitute components from outside the protective shielding. Although these comments and those following are based on pressurized water-type reactors, they may be generally applicable.

The remote control and shielding should prevent plant personnel from any significant radiation exposure during normal operation. When the reactor is down, there will be more likelihood of dangerous exposure. Various personnel, such as maintenance mechanics, electricians, riggers, instrument repairmen, and service and operating supervisors will have to enter the reactor area to effect inspection and repair.

Radiation Exposure Controlled

But decontaminating techniques, strict time limits, local shielding, etc., can hold exposures within the established permissible levels. Under normal working conditions and by exercising routine exposure control measures, personnel should be able to work in reactor power plants for the full extent of their working lives without suffering harmful or even detectable effects.

Compliance with certain radiation exposure guides and standards will be additional task for operating utilities. So-called maximum permissible levels for all types of radiation and radioactive material exposures have been established by national and international committees on radiation dosimetry and allied fields. Values have been tabulated for maxium concentrations in air and water and in the human body for most radioactive materials. Exposure values to external sources



LABORATORY TECHNICIAN monitoring himself for radioactivity before leaving work area. Film badge and dosimeter act as personal monitoring equipment

of radiation under almost all imaginable conditions are available.

Besides shielding, various other exposure control programs are necessary for safe operations. The first of these is a survey program to determine radiation levels throughout the plant. Surveys are especially necessary to evaluate radiation conditions which are liable to change during inspections and as maintenance work. All personnel and equipment leaving the reactor areas should be monitored to insure that they are not carrying radioactive materials.

Periodic Surveys Made

Periodic surveys should be made of the environment, samples of air, water, soil, and perhaps vegetation from the surrounding area to determine that no excessive quantities of radioactive materials are discharged to the environment. Maximum survey activity will take place just before and during initial plant start-up and operation, to insure that the shielding is adequate and contains no voids, and to establish baselines for future work. Considerable survey activity will be necessary also during periods of plant shutdown, inspection, and maintenance.

Medical Exams Required

The second and most important measure is a program of personnel monitoring, including medical examination, and radio-bio-assay. This program requires that select personnel wear pocket radiation dosimeters and film badges to measure accumulated radiation exposure. Personnel may also have to submit urine, blood, or other biological samples for radio-bio-assay, and may receive periodic physical examinations to detect the occurrence of bodily uptake of radioactive material, no matter how slight.

A third measure for radiation protection is proper indoctrination of plant personnel in the procedures for radiation safety and radioactive material handling. This will include initial lectures and demonstrations, and periodic follow-up seminars.

A fourth measure is a program of record keeping. Records must be kept of surveys, personnel monitoring determinations, all discharges of radioactive materials to the environment, and all shipments of radioactive material leaving the plant. It may be necessary to forward some of this information to state or other reguatory agencies so that adequate control of exposure of individual workers may be effected when workers move from one employer to another. Ultimately a central agency may act as a clearing house for personnel radiation exposure data.

New Instruments for Operators

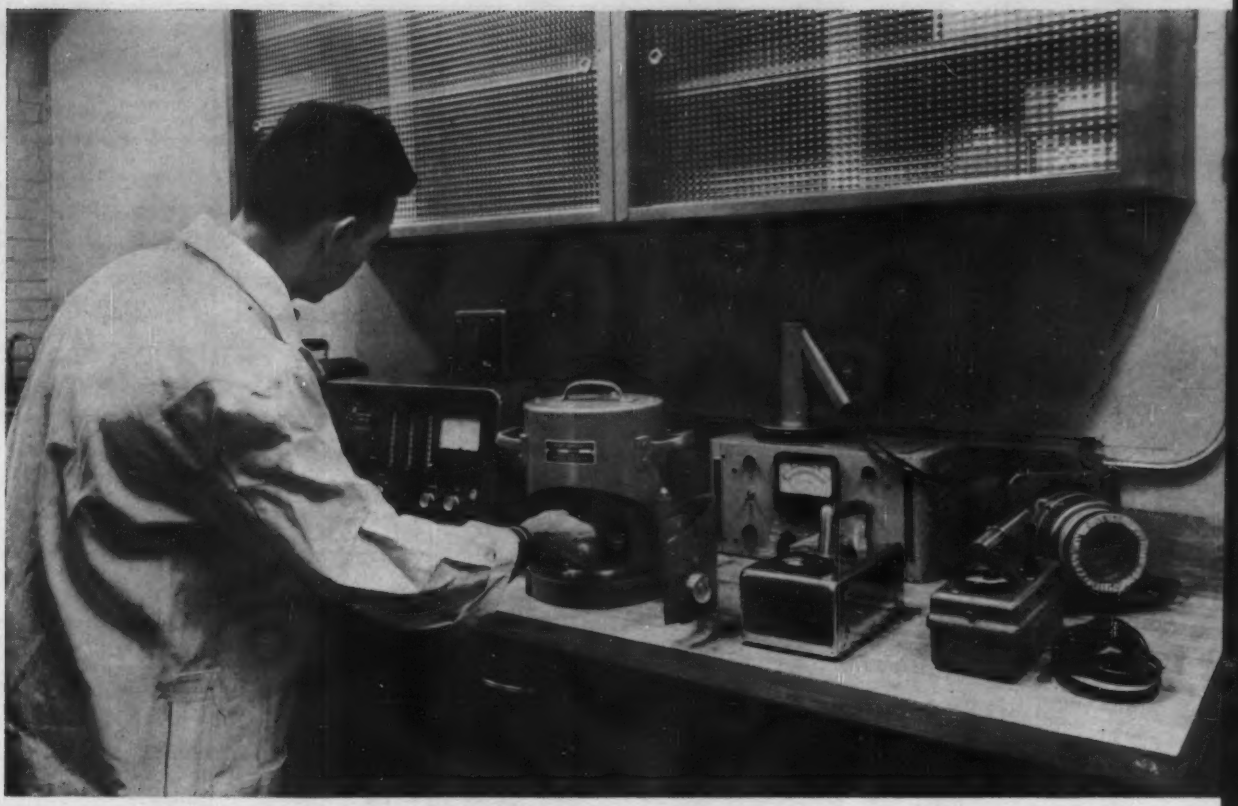
Instrumentation new to the power plant operators will be required for radiation detection and measurement. Such instrumentation is commercially available for all present-day monitoring or survey programs. Surveying and operating techniques have been established to accommodate instrumentation designs with satisfactory results. With the continued improvements in instrumentation, greater economy of survey and monitoring programs is expected.

Two general categories of instrumentation are needed. The first is permanently installed monitoring equipment for use where continual monitoring information is necessary or advisable. It would include monitors in the effluent from the plant waste disposal system maintaining a continuous check on activity released to the environment. Another is the plant area radiation monitors in critical areas with indicators on a centrally located panel board. They should maintain a continual check on radiation levels and may be used to evaluate certain process conditions.

Plant Personnel Will Increase

The second category of instrumentation are those classed as health physics instruments, such as scalers and detectors for sample analyses, count rate meters or hand and foot counters for personnel-survey, and the portable low and high-range radiation detectors.

Specialized personnel, over and above the normal complement of power station personnel, should carry out the radiation protection programs. The number of per-



RADIATION DETECTION instruments typical of those that will be used in a nuclear power plant are shown above. Total cost of the instruments is approximately $4,000. Highly trained specialists will be needed to use and maintain them

sonnel should be a direct function of the plant size. Generally 2 to 3% of the total plant operating staff should provide adequate coverage. These individuals should be under the direct guidance of a person with training and experience in radiation protection work, who could serve also as plant safety engineer. Other personnel may be trained by him, provided these persons have a high school education or equivalent.

Instrumentation mechanics will be necessary to service adequately the specialized instrumentation for radiation protection and for reactor and process control. Additional operating service personnel may administer programs of waste disposal, decontamination, laundry, etc.

Will Become Routine Safety Item

Eventually after sufficient operating experience has been gained, programs of radiation safety and protection will probably assume a status similar to the present-day normal safety programs. Most techniques for routine radiation protection can then be handled by operating personnel in the normal course of their duties. The radiation safety personnel would serve only to guide and consult in these activities, and would perform other specialized duties as necessary.

Outside Services Available

These radiation protection programs can be established by the individual plant as part of the operating program or can be subcontracted to commercial firms. Many firms now supply film badge and bioassay service on a subscription basis. Other firms offer waste disposal services, survey programs, health physics consultation, and the other requirements. Some services will be more economically subcontracted; some will be more adequately handled by the plant. The choice lies with each installation.

Certain other aspects of atomic power and radiation protection have an impact on the utility industry. Under current Atomic Energy Commission regulations, every atomic reactor will be licensed. Compliance with rules and regulations regarding the handling and use of radioactive materials is compulsive under this licensing. These regulations generally specify the manner in which activity may be handled, the quantities of material which may be handled, the manner in which material may be disposed of, and the records and data which must be maintained.

Codes Being Developed

Individual states either have or are preparing radiation protection codes. While codification is still being developed, those interested feel that the passage of time and the increased use of radioactive materials will iron out inconsistencies among the codes. Underwriters of insurance will also create pressures toward regulation standardization.

Tabular Summary of Nuclear Power Plant Progress

One 5-Mw nuclear plant is already operating. Another small A-plant is conducting nuclear power tests, and three plants are slated for '57 operation. Total electrical Mw proposed, including advanced study commitments, is about 1,600 Mw

Company	Consolidated Edison Co	Commonwealth Edison Co and Nuclear Power Group
Plant location	Indian Point, N. Y.	Dresden
Type of financing	Privately financed	Privately financed[4]
Status of project	Construction permit issued	Construction permit issued
Reactor type	Pressurized water	Boiling water
Reactor manufacturer	Babcock & Wilcox Co	General Electric Co
Reactor thermal power, Mw	585	626
Station gross generating capacity, Mw	275[3]	180
Estimated cost of reactor, millions of dollars[1]		
Estimated cost of turbo-gen plant, millions of dollars		
Total estimated plant cost, millions of dollars	70.0	45.0[5]
Total estimated plant cost, dollars per kw	254	250[5]
Estimated cost of energy at busbar, mills per kwhr	10-12	7-8[6]
Estimated operating date	1960	1960
Moderator	Light water	Light water
Coolant	Light water	Light water
Coolant temp, degrees F[2]	500	545
Coolant press, psi	1,500	1,000
Steam temp, degrees F	1,000[3]	545
Steam press, psi	370	1,000
Steam flow, lb per hr	2,200,000	2,600,000
Fuel, enrichment, % U-235	Fully enriched. Thorium used as fertile material	1.5%

[1] Not including research and development, fabrication of fuel for first charge, or nuclear materials unless noted otherwise. Fuel elements fabrication and nuclear materials are included in fuel costs.

[2] Average temperature of coolant in reactor unless noted otherwise.

[3] Will use separately fired superheater to raise steam temperature from 450 to 1,000F. Superheater will provide 112 Mw of capacity, reactor 163 Mw.

[4] Commonwealth Edison will pay $20 million (charged to plant account). Remaining $15 million will be supplied over period of five years by Nuclear Power Group.

Pennsylvania Power & Light Co	Yankee Atomic Electric Co	Duquesne Light Co	Power Reactor Development Co and Detroit Edison Co[9]	Consumers Public Power District, Columbus, Nebr
PP&L service area	Rowe, Mass	Shippingport, Pa	Frenchtown Township near Monroe, Mich	Hallam, Nebr
Privately financed	AEC Power Demonstration Program[7]	AEC 5-Yr Reactor Development Program[8]	AEC Power Demonstration Program	AEC Power Demonstration Program
In research and development stage	AEC contract signed	Advances stages of construction	Conditional construction permit issued	Contract negotiations in progress
Homogeneous	Pressurized water	Pressurized water	Fast breeder	Sodium graphite
Westinghouse Electric Corp	Westinghouse Electric Corp	Westinghouse Electric Corp	Power Reactor Development Co[10]	North American Aviation, Inc
550	492 (392 initial)	236	300	250
150	145 (120 initial)	60 (100-ultimate)	100	80
	23.6 (AEC estimate)	40.6	43.2	26.6
	15.7 (AEC estimate)	12.0	14.5	11.3
		55.0		37.9
		550		475
	12-14			10-11
1962	1960	late 1957	1959	1959-60
Heavy water	Light water	Light water	None	Graphite
Fuel solution in heavy water	Light water	Light water	Sodium	Sodium
465 (inlet) 580 (outlet)	508	540	800	925
2,000	2,000	2,000	115 (reactor inlet)	10
444	470	Saturated	755	825
400	500	585	600	800
2,000,000	1,800,000	835,000 (at 60 Mw)	1,000,000	730,000
U_2O in liquid form. Thorium as fertile material	2.6%	90% in seed. Natural uranium in blanket	25%	2.5%

[6] Based on contract price.

[7] Not capitalizing $15 million of research and development cost.

[8] Under this program AEC will offer certain assistances such as grants for research and development work.

[9] Under this program the AEC intends to construct five preferred types of reactors primarily with government financing.

[9] Reactor by Power Reactor Development Co. Turbine generator by Detroit Edison Co.

[10] Components by several manufacturers to design of Atomic Power Development Associates and Power Reactor Development Co.

Company	Central Utilities Atomic Power Associates[3]	Elk River Rural Cooperative Power Assoc	Municipal Power Dept
Plant location	Northern States Power Co system	Elk River, Minn.	Piqua, Ohio
Type of financing	AEC Power Demonstration Program[4]	AEC Power Demonstration Program	AEC Power Demonstration Program
Status of project	Contract negotiations in progress	AEC reviewing completed contract	Contract negotiations in progress
Reactor type	Boiling water	Boiling water	Organic moderated
Reactor manufacturer	Allis-Chalmers Mfg Co	AMF Atomics, Inc	North American Aviation, Inc
Reactor thermal power, Mw	133	58	45.5
Station gross generating capacity, Mw	60	22[6]	12.5
Estimated cost of reactor, millions of dollars[1]		4.0	3.34
Estimated cost of turbo-gen plant, millions of dollars		2.2	1.96
Total estimated plant cost, millions of dollars	20-25	6.2	5.30
Total estimated plant cost, dollars per kw		282	424
Estimated cost of energy at busbar, mills per kwhr		6.5	
Estimated operating date	1962	1960	1960
Moderator	Light water	Light water	Hydrocarbon
Coolant	Light water	Light water	Hydrocarbon
Coolant temp, degrees F[2]	486	530 (outlet)	617
Coolant press, psi	600	900	30
Steam temp, degrees F	1,000[5]	850[6]	550
Steam press, psi	540	615	410
Steam flow, lb per hr	502,000	225,000	170,000
Fuel, enrichment, % U-235	1.6	Enriched uranium	3%

[1] Not including research and development, fabrication of fuel for first charge, or nuclear material unless noted otherwise. Fuel element fabrication and nuclear materials are included in fuel costs.

[2] Average temperature of coolant in reactor unless noted otherwise.

[3] Members of Central Utilities Atomic Power Associates include:
Central Electric & Gas Co
Iowa Power & Light Co
Iowa Southern Utilities Co
Interstate Power Co
Mississippi Valley Public Service Co
Northern States Power Co
Northwestern Public Service Co
Otter Tail Power Co
St Joseph Light & Power Co
Wisconsin Public Service Corp

Chugach Electric Assoc	Wolverine Electric Cooperative	Southern California Edison and North American Aviation, Inc.	Pacific Gas & Electric Co and General Electric Co	Argonne National Laboratory (AEC)
Anchorage, Alaska	Hersey, Mich.	Santa Susana, Calif.	Vallecitos, Calif.	Lemont, Ill.
AEC Power Demonstration Program	AEC Power Demonstration Program	AEC 5-Yr Development Program for reactor[8] Turbo-gen privately financed	Privately financed	AEC 5-Yr Reactor Development Program
AEC Contract signed	Contract negotiations in progress	Undergoing experimental tests	Construction permit issued	Reactor operating
Sodium-deuterium	Homogeneous	Sodium graphite	Boiling water	Boiling water
Nuclear Development Corp of America	Foster Wheeler Corp	North American Aviation, Inc.	General Electric Co	Argonne National Laboratory
40	31	21	40 max	20 (40 probable)
10	10[7]	7.5	5	5 (10 possible)
5.50	3.78	10.0[9]		
1.85	1.08	1.0[9]		
7.35	4.86		3-4 (AEC estimate)	
735	486			
	7.18-7.43			
1962	1959-60	Critical Apr 25, 1957	1957	Critical Dec 1, 1956 Full power Dec 29, 1956
Heavy water	Uranyl sulfate in heavy water	Graphite	Light water	Light water
Sodium	Heavy water	Sodium	Light water	Light water
950	570	960 (outlet)	545	486
Atmospheric	2,000	3	1,000	600
850	825[7]	825	545	486
850	600	600	1,000	600
	116,000	60,000	82,000 (to turb) 165,000 (reactor max)	60,600
2%	Highly enriched uranium	2.8%	Enriched uranium oxide	1.44%

[4] Under this program AEC will offer certain assistance such as grants for research and development work.

[5] Separately fired superheaters raise steam temperature from 486 to 1,000F.

[6] Will use separately fired superheater to raise steam temperature from 530 to 850F.

[7] Will use separately fired superheater to raise steam temperature from 450 to 825F.

[8] Under this program AEC intends to construct five preferred types of reactors, primarily with government financing.

[9] Cost of entire sodium reactor experiment project including research and development is more than $10 million. Cost of turbine generator plant is over $1 million.

Other Utility Groups Considering Nuclear Power Plants

Ohio Valley Group[1]—propose to build a prototype reactor of advanced design. No facilities will be provided to generate electricity. If the prototype plant proves successful a 200-Mw nuclear power plant will be built within the next six years. A graphite suspension reactor with ceramic fuel elements, a liquid-metal-cooled, natural uranium, heavy-water reactor, and a sodium-cooled, graphite-moderated reactor with ceramic fuel elements are under consideration by the group. Cost of initial prototype reactor will be about $15-30 million with an estimated operating date of 1962.

Florida Nuclear Power Group[2]—a privately financed undertaking. Under active consideration is a heavy-water moderated gas-cooled, natural uranium reactor which will cost about $50 million, have a gross capacity of 150 Mw and reactor thermal power of 680 Mw. Estimated operating date is 1962. General Nuclear Engineering Corp has been retained for reactor plant engineering and design.

Carolinas-Virginia Nuclear Power Associates[3]—Now engaged in technical evaluation studies. Participation in the AEC Power Demonstration Program is being considered. Total plant cost will be about $50 million with reactor plant cost about $10-20 million. Estimated operating date is 1962. General Nuclear Engineering Corp has been retained for reactor plant engineering and design.

New England Electric System—Now engaged in technical evaluation studies for a nuclear power plant of about 200 Mw capacity. Project will presumably be privately financed and it has an estimated operating date of 1963-4.

Pacific Gas & Electric Co—Considering a pressurized water or boiling water reactor under the AEC Power Demonstration Program and for 1962 operation.

Middle South Utilities—Now engaged in technical evaluation studies for a nuclear power plant.

Texas Atomic Energy Research Foundation[4]—non-profit organization engaged in research in the atomic energy field as applied to the generation of electric power. Group does not plan construction of a nuclear power plant at present but has signed a 4-yr, $10 million contract with General Dynamics Corp for a jointly sponsored research program in the field of controlled thermonuclear reactions.

Previous plant proposals rejected by the AEC because technical feasibility has not been demonstrated

1. Gas-cooled reactor used with closed cycle gas turbine and with reactor thermal power of 44 Mw and electrical capacity of 15 Mw. Proposed by the Municipal Gas & Electric Dept of Holyoke, Mass.

2. Liquid-metal-fueled reactor with electrical capacity of 25-40 Mw. Proposed by the Orlando Utilities Commission, Orlando, Fla.

---

[1] Ohio Valley Group includes:
American Gas & Electric Service Corp
Cleveland Electric Illuminating Co
Columbus & Southern Ohio Electric Co
Dayton Power & Light Co
Indianapolis Power & Light Co
Louisville Gas & Electric Co
Monongahela Power Co
Potomac Edison Co
West Penn Power Co
Ohio Edison Co
Pennsylvania Power Co
Southern Indiana Gas & Electric Co

[2] Florida Nuclear Power Group includes:
Florida Power Corp
Florida Power & Light Co
Tampa Electric Co

[3] Carolinas-Virginia Nuclear Power Associates includes:
Carolina Power & Light Co
Duke Power Co
South Carolina Electric & Gas Co
Virginia Electric & Power Co

[4] Texas Atomic Energy Research Foundation group includes:
Central Power & Light Co
Community Public Service Co
Dallas Power & Light Co
El Paso Electric Co
Gulf State Utilities Co
Houston Light & Power Co
Southwestern Gas & Electric Co
Southwestern Public Service Co
Texas Electric Service Co
Texas Power & Light Co
West Texas Utilities Co

This bottom leads a sheltered life

A capacitor bottom needs protection these days. The now-standard 50-kvar unit is too heavy for any man to lift safely. We found this out when we introduced 50-kvar capacitors in 1955. They got dragged and pushed and the bottoms took a beating.

Our solution? We recess the bottoms of every General Electric 50-kvar capacitor. All that touches the ground is the heavy, double-thickness steel rim. The more vulnerable bottom rarely gets scratched or dented.

Please don't misunderstand us. We don't recommend dragging General Electric capacitors around. But we know that this can't always be avoided. So we've done something about it.

If you still have questions, get in touch with your General Electric Apparatus Sales Engineer. Or, write to General Electric, Section 445-4, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

Molded Covers: now on trial

Unique development represents General Electric's first step toward a molded distribution transformer cover with molded-in bushings to reduce costly service trips.

The improved molding material for General Electric's experimental distribution-transformer covers and bushings is designed to prevent creep tracking—a common occurrence when conventional organic insulating materials are used in contaminated atmospheres. In the photo above Distribution Transformer Department's M. Broverman, Mgr. Design Engineering (left), and W. A. McMorris, Mgr. Advanced Product Engineering, study a completed assembly. The molded parts will be given extensive tests on utility systems this year.

The new molding material is an outgrowth of General Electric's development of molding materials resistant to arc tracking, first introduced by G.E. in the late nineteen-forties for molded instrument transformers.

Present design is only first step

The new molded bushings and covers, representing the first step in this development, utilize newly developed materials to replace steel covers and porcelain bushings. Plans for more advanced molded covers and bushings, however, are already on the drawing board and models are already in Pittsfield testing laboratories.

Next: one-piece designs

Present plans call for eventually molding the high-voltage bushing and the cover in one operation to give one-piece construction. This will reduce the number of openings into the tank.

Cost a major factor

Wide manufacture of General Electric's new molded covers and bushings must wait a few years until resin prices—now on the downswing—reach competitive levels. Then utilities can expect several benefits from G.E.'s new development.

Utilities will benefit

Units with molded covers will need fewer repaintings, since the cover, now the part most subject to weathering, will remain factory fresh. Bushings will last longer—molded materials resist damage better than porcelain. Finally, squirrels and birds will not short out units because the cover itself is an insulator.

All Transformers Are Not Alike

Continuous engineering development is only one advantage of General Electric distribution transformers. Others include *engineered packaging*, coast-to-coast *warehouse facilities* for fast delivery, *Formex** wire for reductions in tank size, self-protected transformers with new, improved *circuit breakers*, and many others—evidence that all transformers are *not* alike.

For complete information, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to Section 431-53 General Electric Company, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

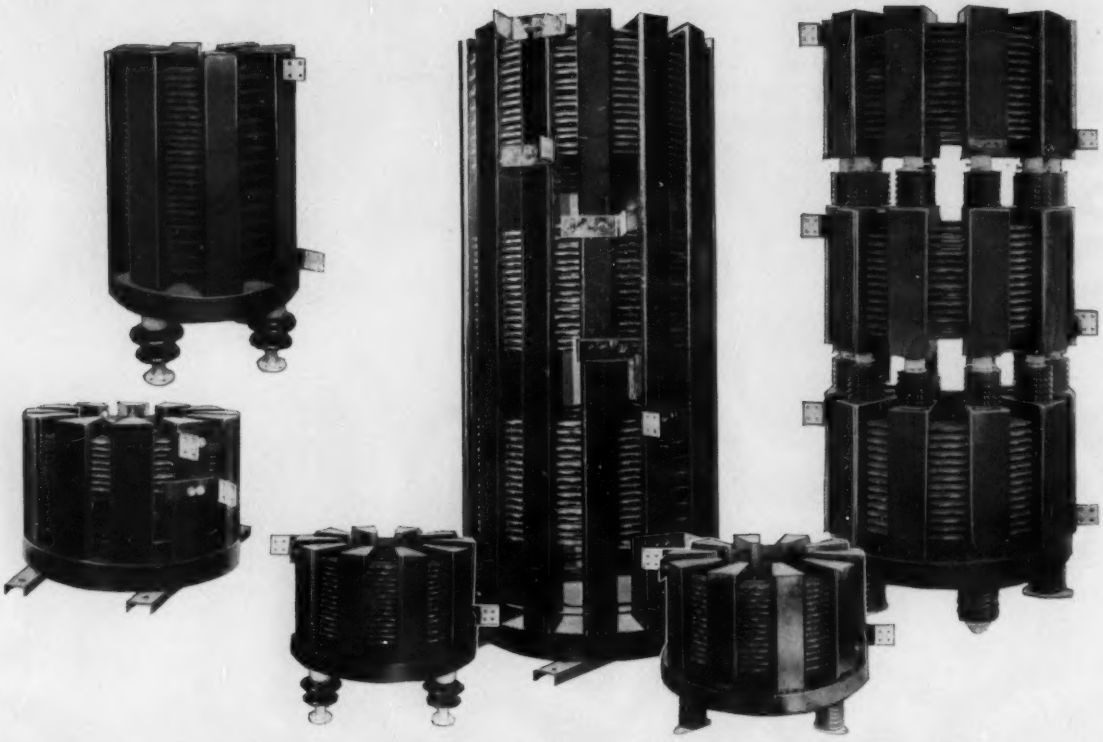
*Reg. Trademark of General Electric Co.

NO MORE TROUBLE WITH SQUIRRELS. New cover is made of non-tracking high-resistance compounds to prevent squirrels and birds from causing line outages, thereby reducing costly service trips.

DIELECTRIC TEST. Simulating an electrical discharge during a heavy rainstorm, test subjects molded bushing and cover to wet flashovers of 50,000 volts at 60 cycles. Despite repeated flashovers, there is no tracking and no damage to the molded materials.

Progress Is Our Most Important Product

GENERAL ELECTRIC



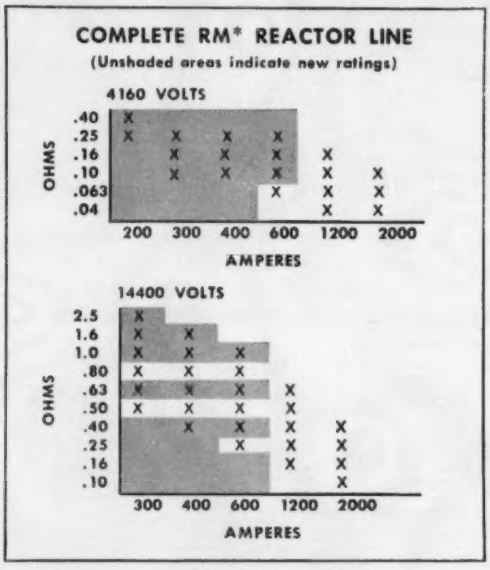
General Electric offers 8% lower prices, faster delivery in 24 new ratings of RM* reactors

8% PRICE REDUCTION and two to three weeks shorter shipment, possible for years with G.E.'s Repetitive Manufacture (RM) reactors, are now available in 24 new ratings up to 2000 amperes in both the 4160- and 14,400-volt classes. This means major savings in your most-required protective ratings.

RM REACTORS HELP PROTECT COSTLY EQUIPMENT and reduce system expansion costs by helping limit short-circuit currents to the capacity of other components. For this reason, G.E.'s reactor ratings are designed to coincide with the standard short-circuit ratings of switchgear, regulators, and other system equipment.

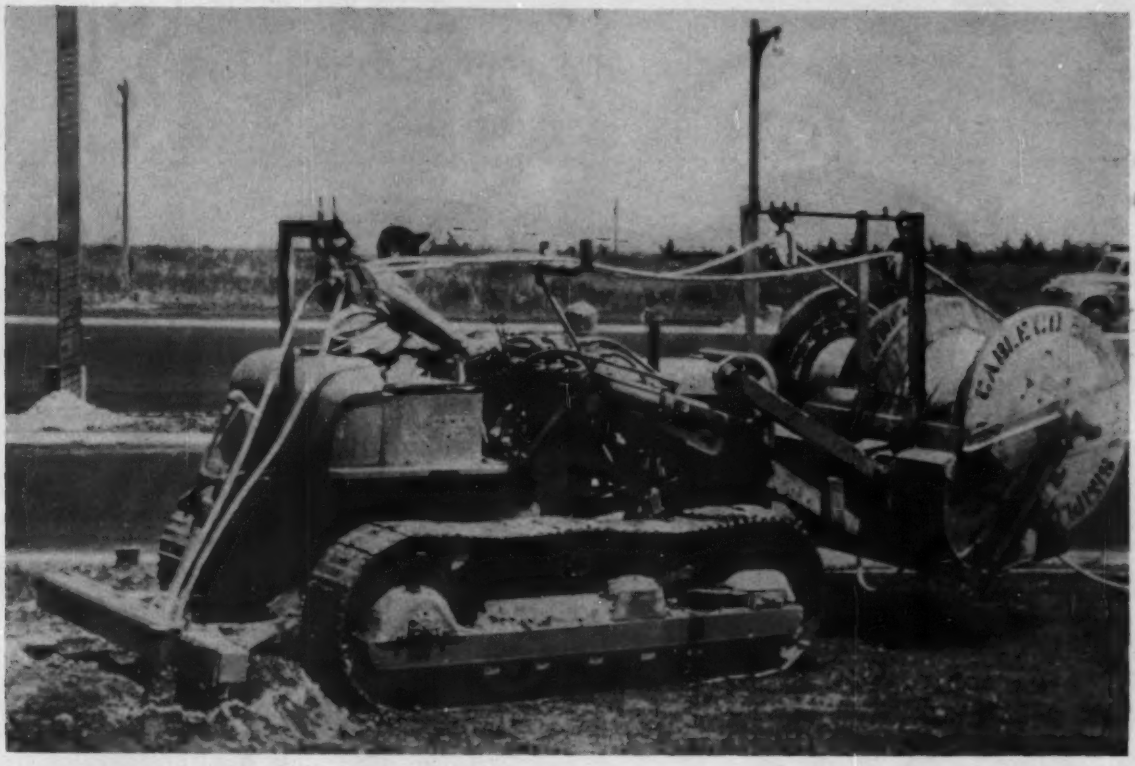
OPPORTUNITIES FOR SAVINGS exist throughout your system. Feeder protection, bus sectionalizing, bus synchronizing, and neutral grounding are only a few of the applications where G.E.'s complete line of reactors can help reduce equipment investment. Full details are available from your G-E Sales Engineer or from Section 422-38, General Electric Co., Schenectady 5, N. Y.

*Repetitive Manufacture



Progress Is Our Most Important Product

GENERAL ELECTRIC



DISTRIBUTION—Construction

Lays Lighting Cable in Continuous Operation

N. E. PICCIONE, Underground Line Supervisor, Long Island Lighting Co, Hicksville, N. Y.

Making one continuous operation of plowing a trench, feeding cable, backfilling, raking, and tamping enable a single man to install 9,700 ft of parkway lighting cable for Long Island Lighting Co in a single day. One man and a tractor rigged with special attachments thus laid in a week as much cable as had been formerly laid in a month by a cable plow pulled by a winch truck.

Cable Reel at Front

In the stepped-up procedure, the cable was supplied from reels attached to the tractor's front. It was fed into the trench made by a tractor plow attachment. A set of four discs then centered loose soil over the freshly plowed earth. The discs were followed by a grading unit, a section of chain-link fencing, which was dragged over the loose soil. The final attachment was a 300-lb roller which, in most circumstances, provided adequate tamping.

Other Costs Cut

This rig, with several other pieces of mechanical equipment, was employed on a major lighting project, calling for installation of 880 standards and 230,000 ft of underground cable along sections of state parkways. No. 8, 5,000-v, neoprene, lead-covered and steel-jacketed copper cable was installed.

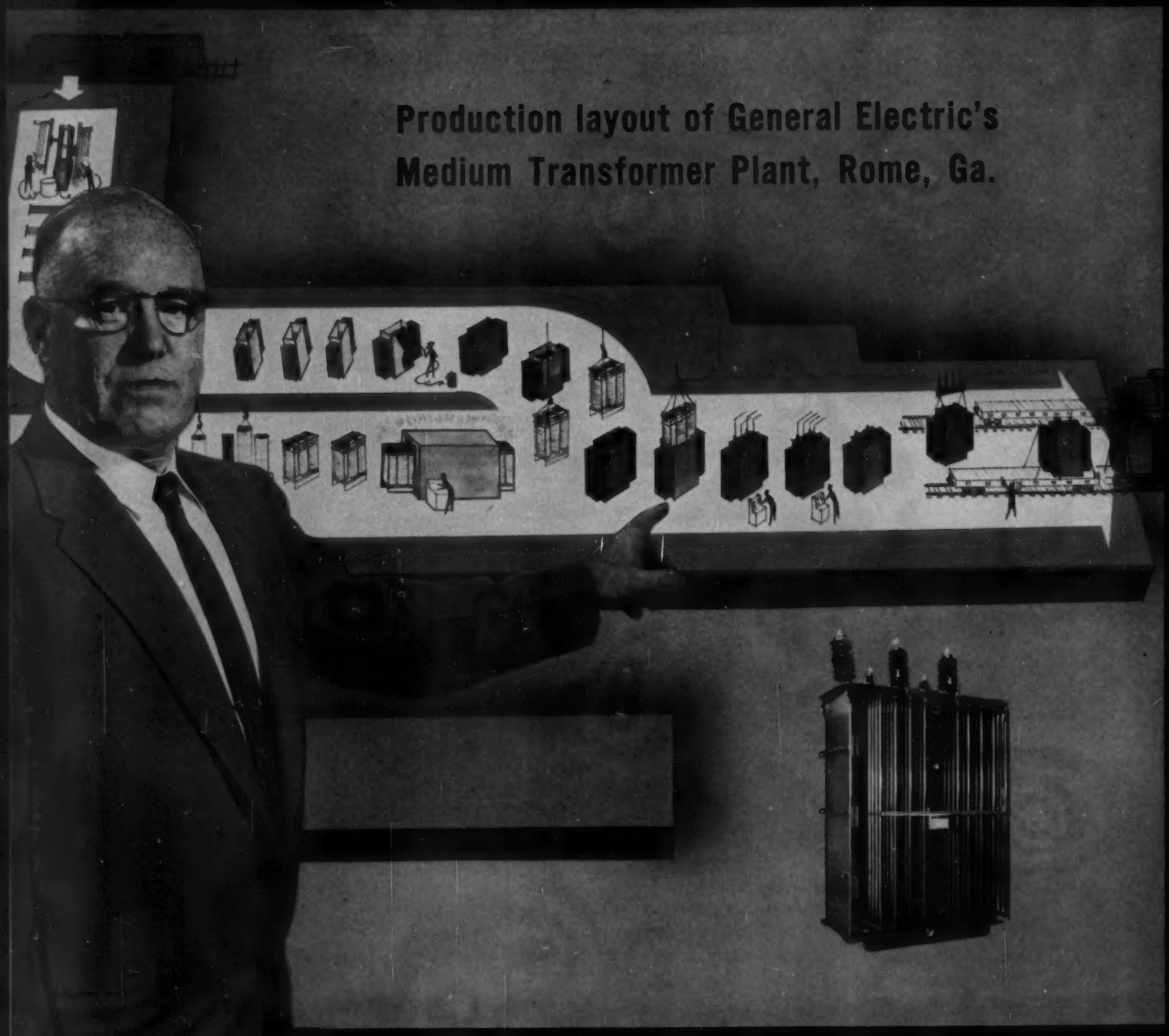
Other portions of the project where labor costs were reduced substantially through the use of mechanical equipment were principally these:

1. Setting isolating transformers.
2. Trenching in preparation for driving conduit under parkway entrances, exits, and bridges.

Isolating transformers were set in holes dug by a power-driven post-hole digger. The holes were 30 in. in dia and depth and adjacent to standards. Space in the hole was enough to permit a splicer to connect the lamp into the circuit.

A rotating bucket-type trench digger dug trenches about 15-ft long preparatory to driving 2 or 3-in. conduits under parkway entrances, exits, and bridges.

(More How To on page 116)



MASS-PRODUCED TRANSFORMERS are a reality today on the assembly lines of General Electric's ultra-modern repetitive manufacture facility in Rome, Georgia. Manager of Manufacturing David Hopley predicts shipments of standard units from factory stock within 10 years.

A GENERAL ELECTRIC 10-YEAR FORECAST:

"Off-the-shelf" delivery of standard-design, automation-produced medium transformers

In 1967, electric utilities will be able to buy standard-design medium transformers direct from manufacturers' stock. This will permit immediate satisfaction of emergency load demands as well as shorter planning cycles for normal load growth. So forecasts David Hopley, manager of manufacturing at General Electric's Medium Transformer Department in Rome, Georgia.

This tremendous reduction in delivery time (from the present 10 weeks for standards, and up to 16 weeks and more for specials) depends on continuing the utilities' established trend to standard transformers. For, as acceptance of standard-design units grows, manufacturers are able to move toward automated production of "stock" medium transformers.

For instance, repetitive manufacture facilities at G.E.'s $25,000,000 Rome, Georgia, plant already have helped halve delivery time of medium transformers in the past 10 years.

YOU GET REAL BENEFITS *TODAY!*

During the transition period leading to entire systems of standard-design transformers, electric utilities are enjoying current benefits from General Electric medium transformers. For example:

Lower price—Standardization of design results in an 8% saving in price on General Electric RM (Repetitive Manufacture) medium transformers.

More and better features—Standard design makes it economically possible for G.E. to offer such extras as Formex* insulated windings, control-center arrangement of instruments and accessories, reversible junction boxes, and many others.

Higher quality for longer life—G-E repetitive manufacture techniques permit 18 assembly-line tests and 22 quality-control inspections during manufacture, to assure dependable operation over a long service life.

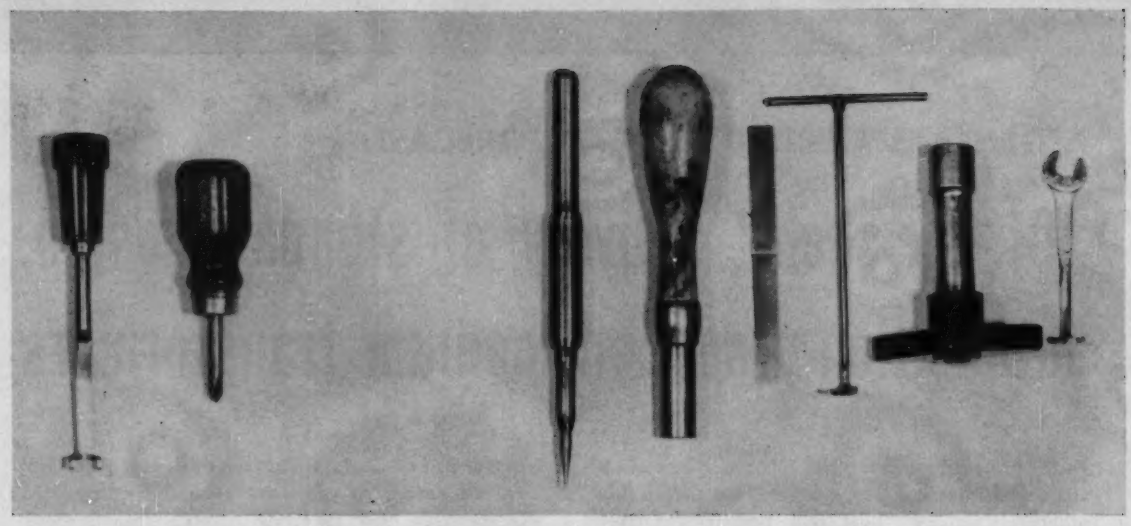
G.E.'S BROAD RANGE OF STANDARDS HANDLES 90% OF ALL JOBS

If your company is not yet taking full advantage of the large dollar savings and other key benefits of medium transformer standardization, act today. Ask your G-E Apparatus Sales Engineer to show you how G.E.'s broad range of standard RM medium transformers can meet the large bulk of your needs, and also work efficiently with older, special transformers now on your system. General Electric Co., Schenectady, N. Y. 416-10

*Reg. Trade-mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC



TOOLS necessary for breaker recalibration are inexpensive and can be made in any machine shop

CSP Breaker Change Adds 20% Capacity

R. L. MIXON, Salvage Section,

J. J. RUSSELL, Distribution Design Section,
Long Island Lighting Co, Hicksville, N. Y.

Twenty percent extra kva is obtained on completely self-protected transformers by increasing the secondary breaker settings to about the same level as those now available. The necessary modification is a portion of routine testing and maintenance. Recalibration cost for the majority of these transformers is 76¢ apiece.

Experience with recalibration indicates that secondary breaker settings of self-protected transformers can be increased economically when these conditions apply:

1. Several thousand or more self-protected transformers with the lower breaker settings are in service.
2. Transformer removals include many self-protected transformers that can be reinstalled.
3. A distribution transformer testing and maintenance shop handles transformers of this type.

When LILCO launched its recalibration program the two manufacturers who produce all breakers used in self-protected transformers, were consulted. Investigation of the recalibration process indicated the procedure consisted of relatively simple mechanical adjustments.

Results were sufficiently accurate to eliminate the need for electric calibration tests. Coordination between the higher breaker settings and the internal primary fuse links was checked. Conflicts requiring fuse changes were found in four sizes of one manufacturer's transformers. Fortunately, these transformers comprised less than 20% of the system's self-protected units.

Recalibrating transformers on the pole was neither practicable nor economical and removing them solely for this purpose too costly.

Why Units Are Removed

In present practice many good transformers are removed because of overload or for routine reasons, such as, reported load increases requiring larger units, shifts in the load center dictating transformer relocation, and consolidation of secondary systems or relocation of transformers because of road widenings. These are the transformers which are recalibrated. Such units are sent to the Salvage Section shop for routine testing, maintenance, and recalibration. They are then returned to stock and eventually reinstalled.

Breaker recalibration instructions supplied by both manufacturers and a few inexpensive tools are the necessary items. The tools can be made in any machine shop. Manufacturers' factory engineers helped train shop personnel.

Recalibration is now performed as a routine function of the transformer test group. More than 1,500 distribution transformers have been recalibrated.

How Cost Was Found

Cost of recalibration was determined by a time and material study of the process over the first few months of its operation. Results of the study show that 90% of the units are recalibrated at an average cost of 76¢. This consists almost entirely of labor costs, as the only material necessary is a new seal for the emergency lever and two spring washers on the breaker. Some units do not even require the washers. The other 10% of the units needed changing of the internal primary fuse links and the recalibration charges varied according to the cost of the links.

ENGINEERING LEADERSHIP
KEY TO ATOMIC PROGRESS

General Electric engineers pre-test reactor servicing techniques in 54-foot-high mock-up vessel

Reactor pressure vessel conditions, including heat and water circulation factors, are simulated in this 54-foot-high refueling test tank. With reactor core mock-ups in the tank, General Electric engineers prove refueling procedures and equipment design before the reactor leaves the drawing board.

To devise a practical method of removing the pressure vessel head closure prior to refueling, tests are now being conducted on the studs used to secure the closure. The studs are insulated and heated under water to study elongation characteristics and removal techniques.

Proving equipment design in the development stage is another example of General Electric engineering leadership in the field of atomic energy. Atomic Power Equipment Department, San Jose, California.

196-7

Progress Is Our Most Important Product

GENERAL ELECTRIC

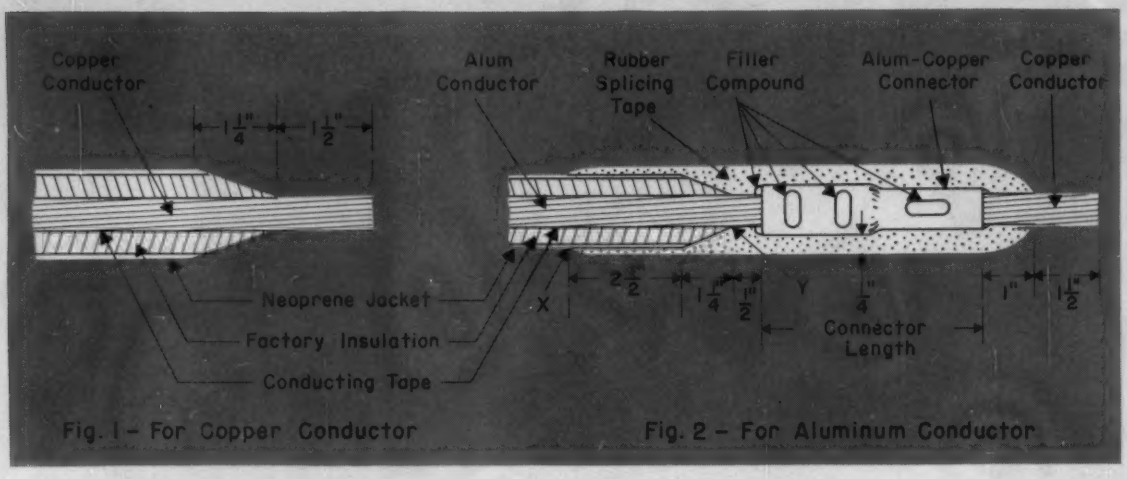


Fig. 1 – For Copper Conductor

Fig. 2 – For Aluminum Conductor

Termination of Preassembled Aerial Cable Non-shielded Type, 5-Kv, Cu or Al Conductor

Step-by-Step methods are presented for terminating non-shielded aerial cable with either copper or aluminum conductor. The procedures are adapted from Distribution Standards of New England Electric System

Procedure for Copper Conductor in Non-shielded Type Cable (Fig. 1)

1 Pencil neoprene jacket and factory insulation at cable end. Finish smoothly.
2 Seal bare copper strands at conductor end by tinning.
3 Avoid bends; cable from ball to cable end shall be straight with no supports.
4 Applying tape; do not reduce 0.75 in. tape to less than 0.5 in. and 1 in. to less than 0.75 in.

Procedure for Aluminum Conductor Non-shielded Type Cable (Fig. 2)

1 Insert copper conductor into reducer end of connector and compress.
2 Cut copper conductor to proper length, seal copper strands by tinning and insert into switch to properly position reducer connector with respect to switch.
3 Train aluminum conductor into position and cut to proper length.
4 Pencil neoprene jacket and factory insulation at cable end. Finish smoothly.
5 Place an oxide inhibitor compound in aluminum end of connector, insert aluminum conductor, compress and wipe off excess compound.
6 Clear neoprene jacket and exposed factory insulation with benzine.
7 Roughen neoprene jacket and exposed surface of factory insulation between points X and Y with smooth rasp (shoemakers) and apply coating of rubber cement, allowing to dry until tacky.
8 Fill indents and voids with filler compound.
9 Build up insulation by applying half lapped rubber splicing tape, over connector to 0.25 in. thickness. Tape shall extend 2.5 in. over neoprene jacket and 0.5 in. over factory insluation.

Note: Avoid bends and apply tape as specified for copper.

Recent Regulator Advances call for a Reappraisal of the old question of which to buy . . .

REGULATORS OR LTC?

by D. D. MacCarthy
Manager—Engineering
Voltage Regulator Product Section

Selection of the proper type regulation usually boils down to dollars and cents. Recent improvements in single-phase step regulators, particularly G.E.'s ML-32 with its standard Load Bonus feature (increases current capacity by 60% at ±5% regulation with no loss of short-circuit capability), have changed the economic picture from what we have known it to be in the past.

It should be noted, however, that there is no "pat" answer as to which type of regulation should be used. Application specifications may call for single-phase step regulators, LTC transformers, three-phase step regulators, or induction regulators.

The charts at the right give the new economic picture for Load Tap Changer equipment and pole-type regulators on an equipment-first-cost basis. Additional factors, such as installation costs and auxiliary equipment, might modify this picture somewhat.

Figure 1 represents a 4-kv wye system. It shows that LTC provides ±10% regulation over a broad range. However, on circuits up to 3000 kva of load, the G-E ML-32 single-phase step voltage regulator offers substantial cost advantages.

Figure 2 covers a 12- or 13-kv wye system. Here, again, the same general relationship exists.

These charts show that the General Electric ML-32 single-phase step voltage regulator usually, within its range, offers *by far* the more economical type of regulation.

For more information on regulator economics, write Section 423–24, General Electric Company, Schenectady 5, New York, or contact your G-E sales engineer or agent.

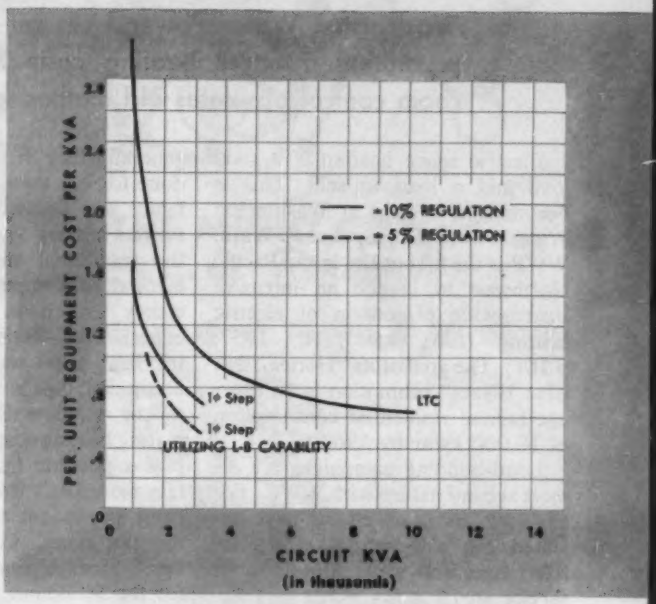


FIGURE 1. Regulating-equipment costs per kva plotted against load on a 4-kv wye-connected system.

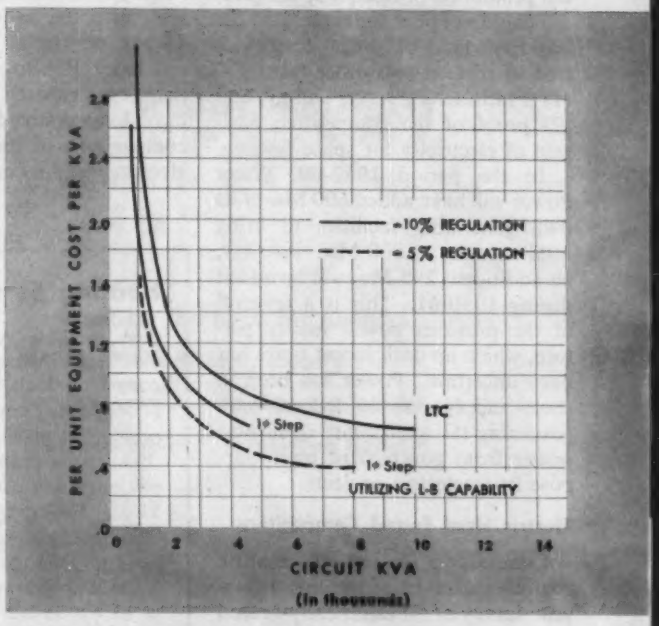


FIGURE 2. Per-unit costs for various regulating equipments on 12-kv or 13-kv wye systems.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Electric Heat: WWP Gets on the Bandwagon

Washington Water Power kicks off intensive, area-wide electric heat promotion. Actual heating costs less than predictions. Individual room control obsoletes old method of figuring heat loss, says Robinson

Electric space heating is a good load and a load to sell! This is becoming a byword at Washington Water Power Co, Spokane, Wash. WWP is the first utility in the Pacific Northwest to launch an intensive system-wide promotion of electric heating (EW, Mar. 18, 1957, p 101). The goal of its "Hotter Than Blue Blazes" promotion is an average annual residential consumption of 10,000 kwhr by 1962-63.

Load-building campaigns are almost second nature with WWP. For example, its sales efforts have resulted in a 90% saturation of electric ranges and water heaters in its service area.

But the decision to launch an all-out promotion of electric space heating could not be made merely on the basis of load-building. Rather it had to rest on two other factors—(1) a satisfactory power supply, and (2) proof of the competitive position of electricity for space heating.

In the period 1952-60, Water Power will have added 600 Mw of its own generating facilities to bring total capacity to 800 Mw. Possibly, an additional 295 Mw will be added during 1960-61. This is a reversal of the previous power supply picture, which up until recent times has been uncertain. Power has been in short supply due to federal laws governing the availability of surplus power from government multi-purpose hydroelectric projects.

Electric Heat Found Competitive

Competitive nature of electric heating was revealed through a two-year survey of 50 electrically-heated homes in Spokane, chosen from about 7,000 customers who use electric heat. The survey showed that an average, well-built, fully-insulated home of 1,000 sq ft in eastern Washington or Northern Idaho could be heated for $165 or less annually.

Prior to the survey, it was held generally that the job could not be done for less than $240. The lower figure was determined when Water Power heating specialists replaced the traditional thermal equivalent method of computing heating efficiency with data based on actual experience. A comparison of electric heat vs oil was also made (see accompanying box).

The traditional method of estimating heating costs determined that it was possible theoretically to obtain more Btu's from oil or gas than from an amount of electricity costing the same. Computed on this basis, average annual heating costs for the 50 homes would have been about $240, or about 23¢ per sq ft. Actual costs were found to be much less, with the average at $169, or 16.56¢ per sq ft.

Kinsey Robinson, Water Power president, reports "some engineers have long doubted that theoretical comparisons of fuel costs apply to electric heat applications where control is at numerous points throughout a home. This survey bears out their thinking." He also points out the large majority of houses surveyed were below the average, ranging upward from a low of 7.65¢ per sq ft. Only 31% revealed an annual sq-ft heating cost above the average. These generally were installations poorly engineered or constructed, or ones in which insulation was misused.

The survey also showed that 20 of the 50 homes have a coincidence factor of less than 70% during the coldest month of the year. Furthermore, the average annual load factor of customers with electric heating, based on individual demands, is better than the load factor of average or high-use customers without electric heating.

Promotional plans for electric heating were announced at the Spokane showing of the recent LBE national telecast before more than

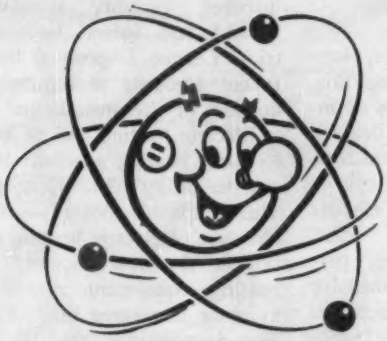
(Continued on page 122)

Heating Survey Data Debunks Competitors' Claims

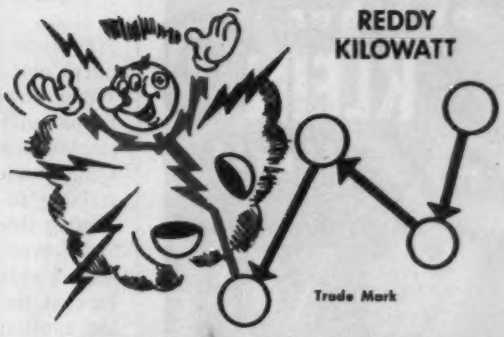
Washington Water Power Co has amassed operating data from 50 electrically heated homes which disprove claims made by suppliers of competing fuels that electric heat is prohibitive in cost. A comparison of the actual cost of electric heat with oil will illustrate the competitive position of electric heat.

Using the traditional thermal equivalent method of computing heating efficiency and with oil at 18.9¢ per gal, 1 million Btu would cost about $1.35. Taking oil heat at 70% efficient, the electrical equivalent for delivered heat would be 205 kwhr. At the prevailing WWP rate of 1.2¢ per kwhr, the cost would be $2.46.

Oil suppliers have been using a factor of 1 gal or 18.9¢ per sq ft per yr in estimating heating costs. However, WWP's survey of a number of well-built homes heated with oil revealed that 11-13¢ per sq ft is more reasonable. The average size of all-electric home in the companion survey was 1,040 sq ft. An estimated cost for oil heat using 11-13¢ would be about $125. Using the oil suppliers' factor of 18.9¢, the cost would be $215, and the expected cost for electric heat on this basis would be about $230. Instead, the actual average cost of electric heat as determined in the survey was $169, which compares favorably with $125 for oil.



REDDY KILOWATT
The Mighty Atom
Trade Mark



THE MIGHTY ATOM
...in Person!

REDDY KILOWATT
The Mighty Atom
Trade Mark

REDDY KILOWATT
Your Electric Servant ®

I'm a very busy atom,
I split myself in two,
And multiply as many times
As I have jobs to do.

I work by the hour for pennies
I'm fast, efficient, steady . . .
So any time . . . to do your work—
Just "plug in," folks—I'm Reddy!

Reddy Kilowatt®
Your Servant of the Century

Reddy Kilowatt is a registered trade mark of Reddy Kilowatt, Inc. and licensed investor-owned utility companies in the United States, Bermuda, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Jamaica, Mexico, Panama, Philippine Islands, Portugal, Venezuela, etc.

Pat. Pend.

*KLEIN KUT PLIERS

for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

There's no extra hinging of any kind—no uncomfortable wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available

Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

*Trade Mark

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

Mathias KLEIN & Sons Established 1857 Chicago, Ill., U.S.A.
3200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

(Continued from page 120)

300 local bankers, builders, suppliers and others. Following this, Water Power staged a series of informational meetings with dealers, employees and electrical contractors. Utility sales people got special training to better tell the electric heating story.

In these training classes, personnel were given a comprehensive look at the factors which bear on the application and selling of electric heat. These included:

- A review of heating theories effecting human comfort.
- Detailed discussions of heat transmitting qualities of nearly all building materials used.
- The importance of proper insulation, and heat transmission coefficients of building sections.
- Heat loss calculation.
- Heating equipment application, cost analysis and survey reporting.
- Weather data and heating costs on a degree-day basis.

Campaign to Use All Media

The initial advertising campaign will extend through November, 1957. The utility will use newspapers, radio and television, outdoor signs, carcards, and dealer window banners. Later in the year a Spokane bus will become a traveling display "spectacular" in the city. The campaign booklet "Hotter Than Blue Blazes" has been sent to dealers and others in the area.

Specially trained company speakers are carrying the electric heating message to civic and service clubs. They emphasize convenience, reliability, safety, competitive cost, ease of installation, flexibility, and space saving. Engineering and consulting services are available without charge to customers anywhere in Water Power's service area.

Following notification for service to an electrically heated home, Water Power sends a service counselor with the electrical contractor to determine the adequacy of the installation. Together they run heat loss calculations and complete a form covering the style of home, type and degree of insulation throughout, and the amount and location of electric heating equipment. The installation is indicated as either meeting or not meeting installed capacity standards of NEMA and Inland Empire Electrical League. Approval by Water Power amounts to informal certification of the installation.

Electric heating will be available to home heating accounts throughout the utility's 30,000 sq-mi area. The company is not advocating any one type of electric heating installation as "the most efficient." It feels heating equipment manufacturers more or less agree that all electric heat installations are 100% efficient if properly engineered and installed. "There is no evidence to the contrary," say company heating specialists.

More than half the homes in the survey were below the average per sq ft heating cost. Thus, Water Power feels any home which can take advantage of insulating materials to maximum efficiency probably will fall below the average cost of 16.56¢ per sq ft per year. Nevertheless, the company is taking local conditions into account in the promotion. "We must remind our customers," says Robinson, "that about 25% of total annual heating costs will come during January-March. Homeowners who are accustomed to buying and storing ordinary fuels throughout the year will need to be acquainted with this factor."

H & C BRIEFS

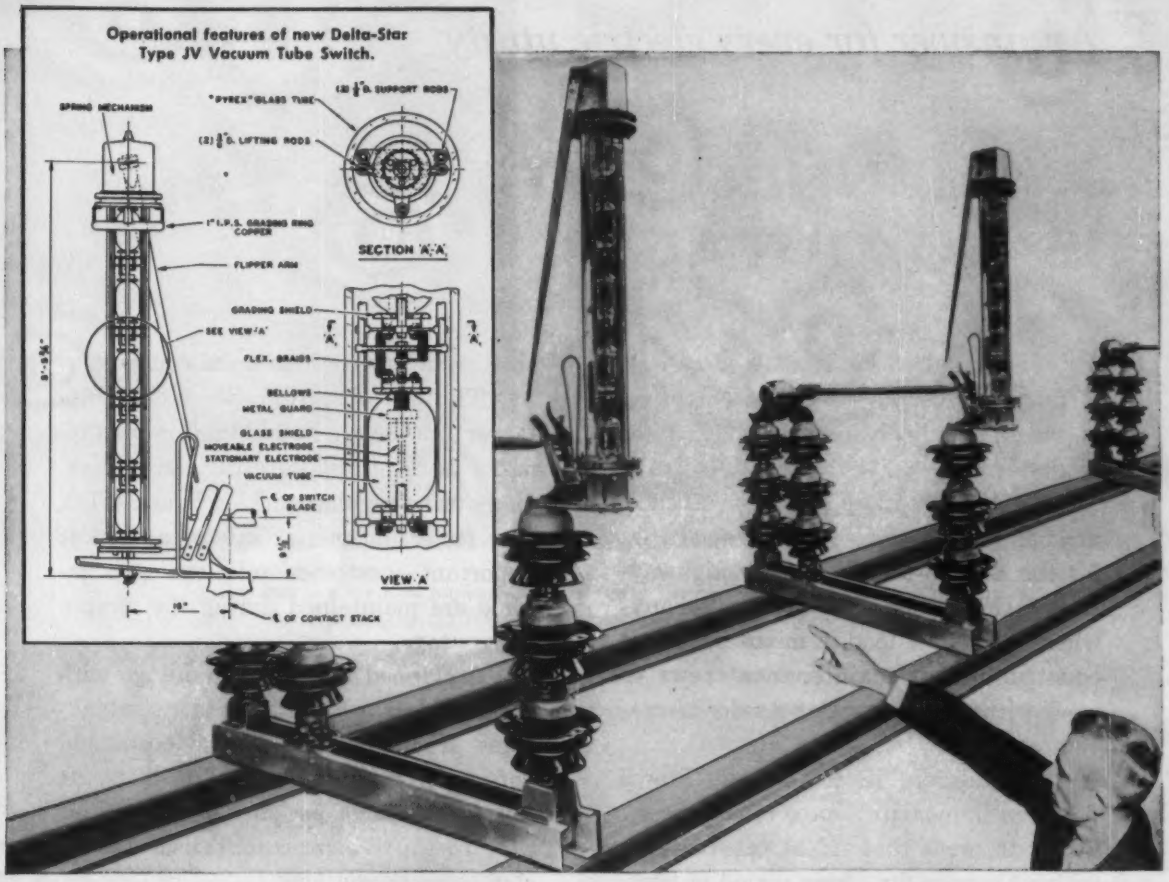
More Heat Pumps for APCO

The number of heat pump users on Alabama Power Co's lines is climbing fast. So are those using other types of electric heating. Total number of residential customers contracted for electric space heating in 1956 was 688.

Carrier Broadens A.C. Line

Carrier Corp recently broadened its packaged air conditioner line. It added to the self-contained Weathermaker line 10 and 15 hp air-cooled units. They have been designed for commercial installations such as stores, business offices, shops and small industrial buildings. The new models feature a compressor said to use less power at peak loads.

(More Selling on page 126)



DELTA-STAR Announces NEW High Voltage MKV-40 Interrupter Switch

Provides positive current interruption for load and capacitor switching.

The new Delta-Star MKV-40 Interrupter Switch is especially well suited for switching capacitive loads. A series of vacuum switches having extremely high dielectric strength does the job. Ratings 34.5 kv to 138 kv are now available.

Vacuum switches are in the circuit only during the interrupting cycle. Interruption occurs at first current zero with no restrikes. Jennings vacuum switches used in this device require no maintenance.

Get all the facts about this new Delta-Star switch from your nearest representative. Or, write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Ill. Offices in principal cities.*

HKP **DELTA-STAR ELECTRIC DIVISION**

H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Alloy Metal Wire, Connors Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Loschen Wire Rope, McLain Fire Brick, Quaker Pioneer Rubber, Quaker Rubber, Riverside Metal, Vulcan Crucible Steel, W-S Fittings.

An answer for every electric utility

A PLANNED OUTAGE IS NO OUTAGE

Five hundred kw is not a large unit of power by utility standards. Not, that is, unless it is badly needed . . . and not available.

That's why more and more utilities are finding an increasing number of uses for the Electro-Mobile 500 kw highway-trailer generating unit. It can go anywhere, pick up a load in minutes, permit construction or maintenance crews to work without interrupting service to customers.

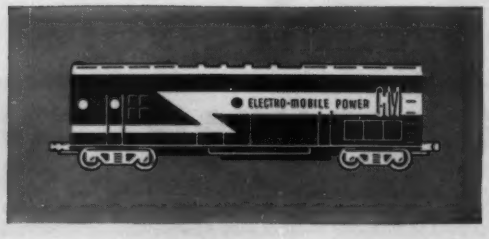
In addition, Electro-Mobile Power offers an immediate source of emergency power to areas that might otherwise be without service for a long period of time. Used in multiple, there is no limit to the amount of power these units can supply.

The savings from Electro-Mobile Power are many. Rebuilding or maintenance work of any duration can be handled during regular working hours. Work goes faster, in greater safety, and most important—customer relations and income are maintained during the temporary outage.

A planned outage is no outage with Electro-Mobile Power. Its many advantages are helping to reduce costs and improve service for many utilities. It can do the same for your system. Your Electro-Motive representative will be glad to show you how.

Here's how one Midwestern utility company uses its Electro-Mobile trailer . . .

In a span of twelve months, this utility used its Electro-Mobile trailer on fifteen different jobs. Shown here are some examples of the work completed and in progress with this unit. During the year the mobile trailer was operated over 340 hours. On one job alone, it was used 145 hours, delivering 58,500 KWH.

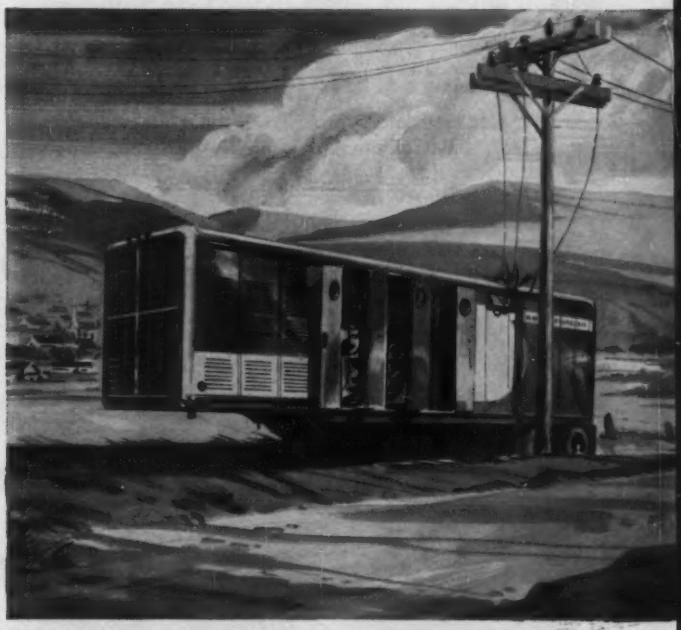


Rail Car—develops 1,000 kw. For use on rail sidings or placed on piers for semi-permanent installation.

Relocating 12,400-volt line for new highway.
Hours used: 68 ¼ KWH generated: 22,700

Installation of new transformer for substation.
Hours used: 3 ½ KWH generated: 1,100

Feeding 12,400-volt sub-transmission line while stringing new conductors on transmission line.
Hours used: 145 KWH generated: 58,500



Handling daily peaks while existing transmission line and substation are being rebuilt.
Hours used: daily average 4

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

LA GRANGE, ILLINOIS

Sales Offices in Chicago, New York, St. Louis, San Francisco

Electric heaters in grain elevator . . .

Reduce Fire Hazard, Cut Insurance Rates

R. P. BOWERS, Director of Power Sales, Interstate Power Co, Dubuque, Iowa

Six electric heaters, installed in the office of the grain elevator, have eliminated a fire hazard and reduced insurance rates at the Farmers' Grain Co, Grand Meadow, Minn. And the installed cost was 80% lower than that for a steam plant. With these advantages and the added convenience, the owner is completely sold on electric heating despite a rate of 3.5 cents per kilowatt-hr.

With electric heating, insurance was cut by 4 cents per $1,000 valuation, reducing the premium $32 per year. To obtain an equivalent saving with conventional heating a steam plant would have had to be built in a separate building. Including the cost of steam piping to the office building, total investment would have been $3,000. Total cost of the electric installation was only $600.

From Jan. 15 to March 20, the electric heaters used 2,700 kilowatt-hr, or an average of 41 kwhr per day. Heating cost for the period was $94.50 or $1.41 daily. From this data, the annual heating cost was estimated at $230. Savings in maintenance, estimated at $15 to $25 per year, plus the reduction in insurance premium reduces the electric heating costs to about $175 annually, to be weighed against other fuel costs and the convenience of electricity. Conventional stoves were ruled out because down drafts blew coals out of the stove, creating a fire hazard.

Quality insulation and proper installation were one of the keys to customer satisfaction with this job. The author made the layout, recommended the type of equipment to be purchased, and estimated the cost of making the installation.

The area to be heated was insulated with 3⅝-inch bats on the side and 6-inch bats in the ceiling. Storm doors and storm windows were provided for the heated area.

To assure adequate temperature control, a dual temperature thermostat was installed. It was set to provide a temperature of 70 F from 6:00 a.m. to 6:00 p. m. and between 35 and 40 F during the night. A seven-day clock sets the schedule for each day separately and holds the temperature between 35 F and 40 F on Sundays.

Mr. Peterson of Farmers Grain Co, reports that he is 100% sold on electric heating.

Electric Strip Heaters Simplify Asphalt Mixing

GEORGE H. MAIER, Electric Heating Engineer, Power Sales Dept, Dayton Power & Light Co, Dayton, Ohio

Electric strip heaters installed on an asphalt mixing tank at the Englewood Asphalt Co, Dayton, Ohio, cut the installation costs and keep the asphalt free flowing at all times. Twelve 2.5-kw heaters, mounted on a 2.5 by 3-inch angle iron, make up the installation. The angle iron is inserted in a four-inch pipe which extends all the way through the 12,000-gallon tank. Operated at 240 volts the strip heaters hold the asphalt at a steady 325 F. Two extra pipes permit installation of additional heaters if necessary.

Installation costs were considerably lower than the hot oil circulating system originally proposed. Two 10-kw circulating oil heaters heat the jacketed piping and pug mill. Highly satisfied with the strip heaters, the owner is considering adding another tank this year.

TWELVE 2.5-KW STRIP heaters keep 12,000-gal. tank of asphalt fluid enough for good mixing. Mounted on angle iron, they are inserted in 4-inch pipe

Compare cost of Regulators and LTC Transformers

Regulators save $4,167

Here's the money-saving way to regulate taking full advantage of *Vari-Amp* on Allis-Chalmers regulators.

1.
Select substation size: In example shown, we used: 3750 kva, 13.2 kv, 164 amps, self-cooled.

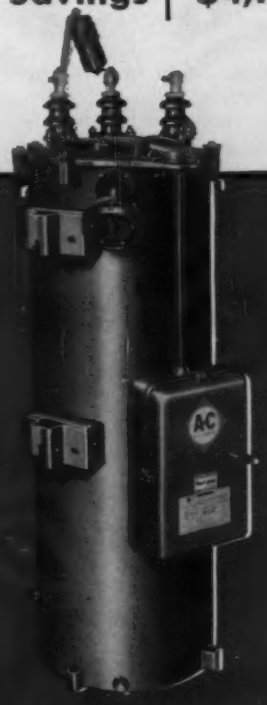
2.
Determine percent regulation required. Here's the important step. A careful check will disclose that few systems actually require full ±10% regulation today. In this example +8¾% −7½% is needed.

3.
Select proper size regulating unit based on current or kva and range of regulation.
To do this job, set up the no load taps on the transformer (or order an alternate voltage) for a 2½% voltage raise. It is then necessary to get only +6¼% raise from the regulator to obtain the desired 8¾% total raise.

On the buck side, −10% regulation from the regulator will provide the needed −7½% regulation for the system. The +2½% in the transformer algebraically added to −10% provides the −7½% buck.

Since an Allis-Chalmers regulator with *Vari-Amp* providing +6½% −10% regulation costs less than a ±10% unit of any type, you save $4167.00.

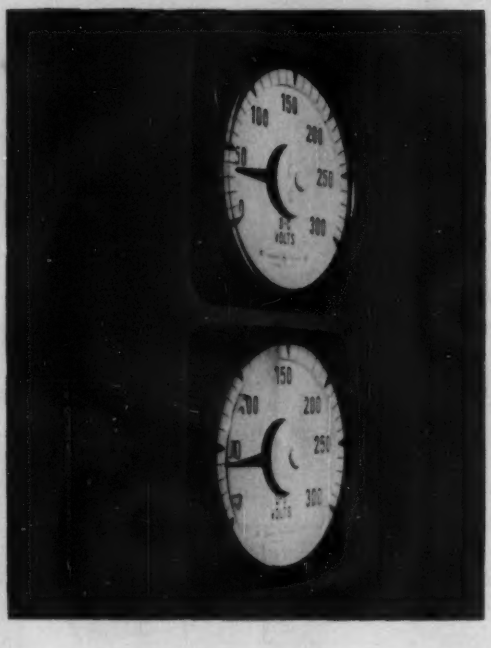
Here's a typical cost comparison on a 4330-volt feeder:	
Load tap changing portion of transformer	$9,471
3 single-phase Allis-Chalmers distribution regulators using *Vari-Amp*....	$5,304
Savings	**$4,167**



Get the Key to Low Cost Regulation (No. A-5307) with complete charts and explanation of how to figure savings with *Vari-Amp*. Call your nearby A-C office, or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

A-5332



Switchboard Instruments

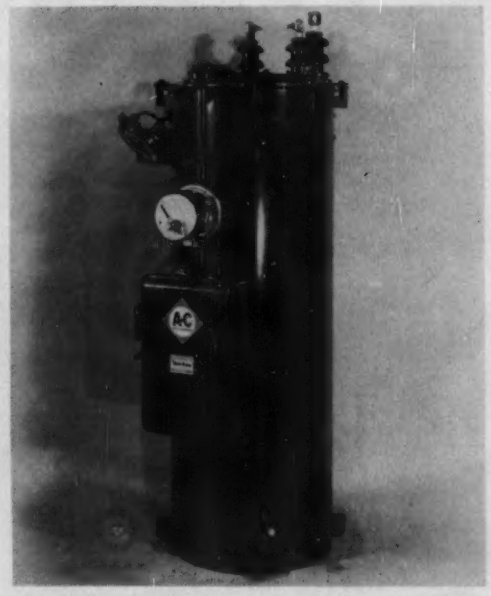
Designed for utility and mill use where distant angular readings with maximum legibility are necessary, these switchboard instruments are said to be easily legible at angles of ±60 to 65 deg. They include voltmeters, ammeters, wattmeters, power factor meters, frequency meters, varmeters, temperature meters, synchroscopes, and ground detectors.

Tapered pointer tip is in same plane as scale markings to eliminate parallax errors. Instruments are said to be well shielded from external fields and to withstand 10 times full-scale quantity for one second without mechanical damage. Weather-tight cases are available.
General Electric Co, Schenectady 5, N. Y.

Demand Meter Kit

This demand meter kit is intended for utility use in making feeder load surveys for planning guidance. It is said to be easily mounted on distribution voltage regulators.

The meter responds to the heating effect of the load in amperes, the limiting factor of the feeder circuit capacity. A current transformer mounted inside the meter steps up the control current to the desired meter current. Two taps on the current transformer make it possible to read either 3 amp or 6 amp full-scale deflection. Taps can be changed by two metal strips on the rear of the meter.
Allis-Chalmers Mfg Co., Milwaukee 1, Wis.



Insulation

An insulating material composed of continuous filament glass fabric coated with semicuring epoxy resins on one side is available as layer insulation where bonding between adjacent layers of coil build-up is required. Transformers coils, edge-wound coils, field coils, and similar applications requiring Class B insulation are suggested uses.

Material is split into tapes of desired width, wrapped half-lapped over part being insulated, and bonded by using pressures of 100 to 150 psi, at temperatures of 135 to 150 C for 30 minutes, with an after-bake period of six to eight hours. The cured, void-free insulation is reported to have a dielectric strength of 400 v per mil thickness.
Westinghouse Electric Corp, Micarta Div, Trafford, Pa.

Street Light Controls

Lumatrol multiple relays for control of street and highway lighting are available in four models: WM and WMF fit all standard watthour meter cases, with the WMF including a built-in 30-amp fuse; WMFB has the fuse mounted on the back plate and will fit all meter cases with sufficient fuse clearance; the PM parallels the WM but is intended for pole mounting and requires no meter base.

Equipped with No. 10, 18-in. leads, all models feature lifetime mercury-to-mercury contactor and are said to provide reliable operation over a range of 90 to 130 v, 60 cps. A 230-v model is also available.
(Continued on page 137)

Mushrooming Suburbia

Once-rural lines become heavy load

How often have your engineers and line crews faced a situation like this?

Acme Land Company buys the old farm out the north road from town, subdivides it and promotes "Luxurious Electrical Living in Oak Hill Acres".

That puts the load on you . . . immediately . . . and the old north road feeder has to be stepped up, fast.

The things that happen next can be good, depending on how you look at it. The promotion catches on. Next comes the shopping center. More developers cluster around and a quiet rural line has suddenly mushroomed into a booming suburb.

That's when you appreciate the extra values engineered into Westinghouse equipment . . . basically sound electrical designs with thoughtful provision for fast, safe and easy installation. The following pages point out the extra values.

YOU CAN BE **SURE**... IF IT'S Westinghouse

POLE-TOP SAVINGS IN SUBURBIA . . .

The Westinghouse transformers you hang today give 20% extra margin for load expansion

Brighter prospects are in store for electrical living. To help carry the new and anticipated loads, overload capacity of all Westinghouse CSP® and Type S transformers has been increased 20%. This added capability is a solution to the problems in sudden growth areas. Now you have more time for load checks, better service planning. It means fewer trip-outs, fewer emergency service calls, greater flexibility for timing change-outs. Breaker emergency settings on CSP transformers are up an additional 15%, insuring service during emergency overloads.

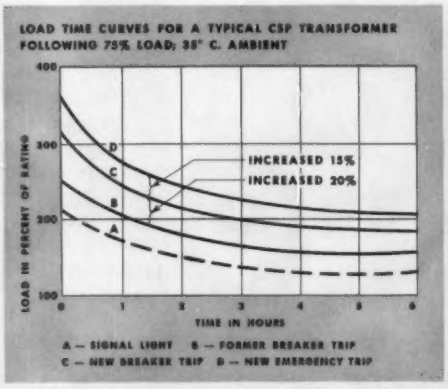
An optional thermal-duty indicator on Type S transformers provides easy, practical load monitoring—a red signal light, set at ASA level, shows overloading; a dial records cumulative overload hours. Extremes of burnouts in some locations, wasted capacity in others, can be avoided.

Proved by Functional Life-Testing . . . greater, longer overloads *without sacrifice of normal service life.* Westinghouse life-tests *complete units* under simulated service conditions, with aging accelerated ten times—thirty years' normal life compressed into three.

Three years' laboratory life-testing, backed by four and one-half years' field operation at three major utilities . . . without a single failure! This field experience of 10,412 Westinghouse transformers proves their thermal endurance . . . proves they can handle the electrical growth of mushrooming Suburbia, economically and faithfully.

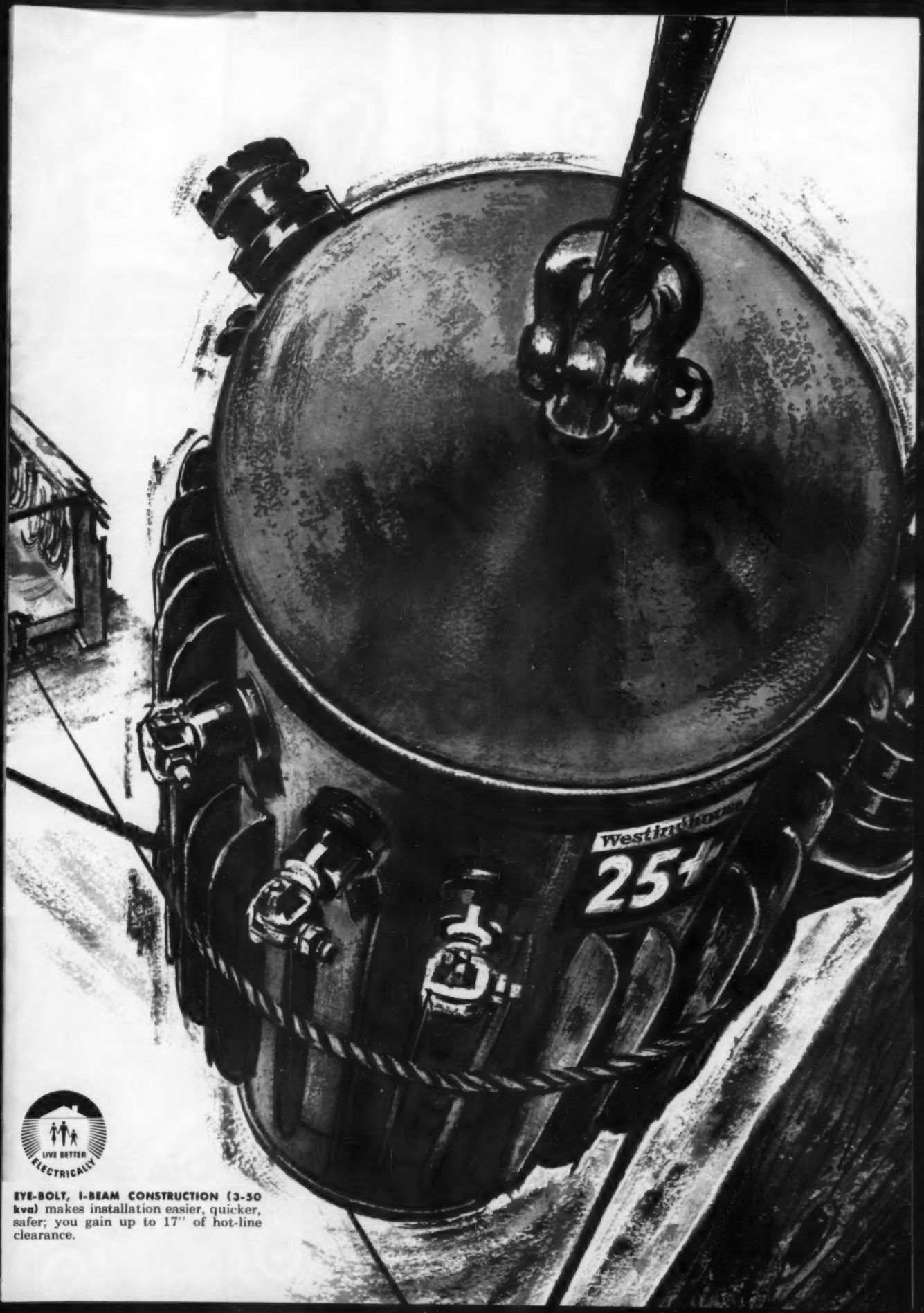
YOU CAN BE SURE... IF IT'S Westinghouse

REDUCED HEIGHT SAVES POLE SPACE (25-167 kva) allows replacement with next larger rating without change in secondaries.



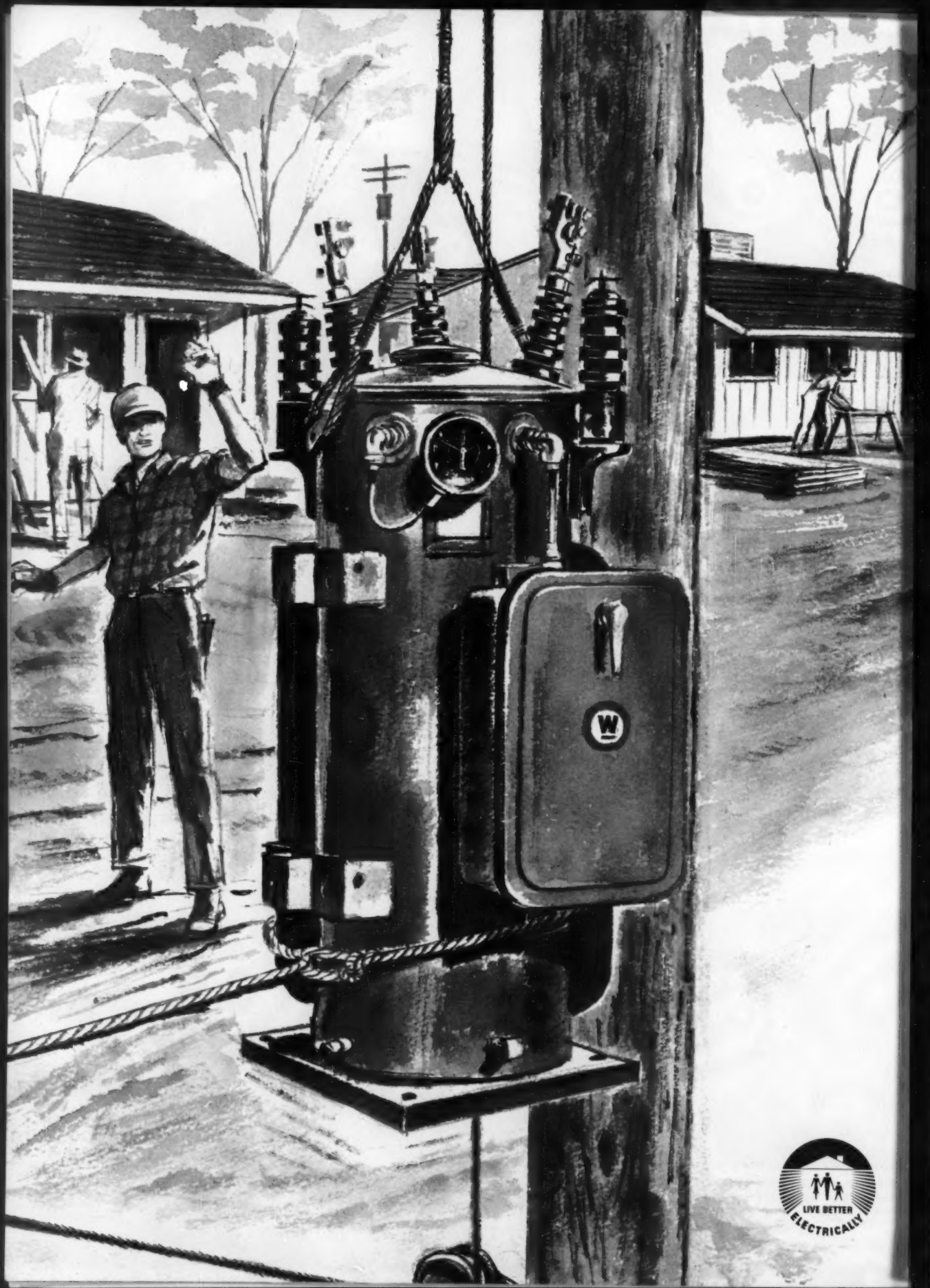
HIGHER BREAKER SETTINGS provide 20% greater overload capacity for the new Westinghouse CSP transformer, 15% more emergency range.

CUMULATIVE OVERLOAD RECORD Thermal-duty indicator measures overloading accurately, on basis of copper temperature. Optional with Type S units.



LIVE BETTER ELECTRICALLY

EYE-BOLT, I-BEAM CONSTRUCTION (3-50 kvu) makes installation easier, quicker, safer; you gain up to 17″ of hot-line clearance.


LIVE BETTER
ELECTRICALLY

FOR LOAD GROWTH IN SUBURBIA . . .

Westinghouse URL and URF step regulators maximize customer service

For Suburbia's new areas of electrical living, the Westinghouse system of voltage regulation, a unique combination of work-together voltage regulation principles, pays off with:

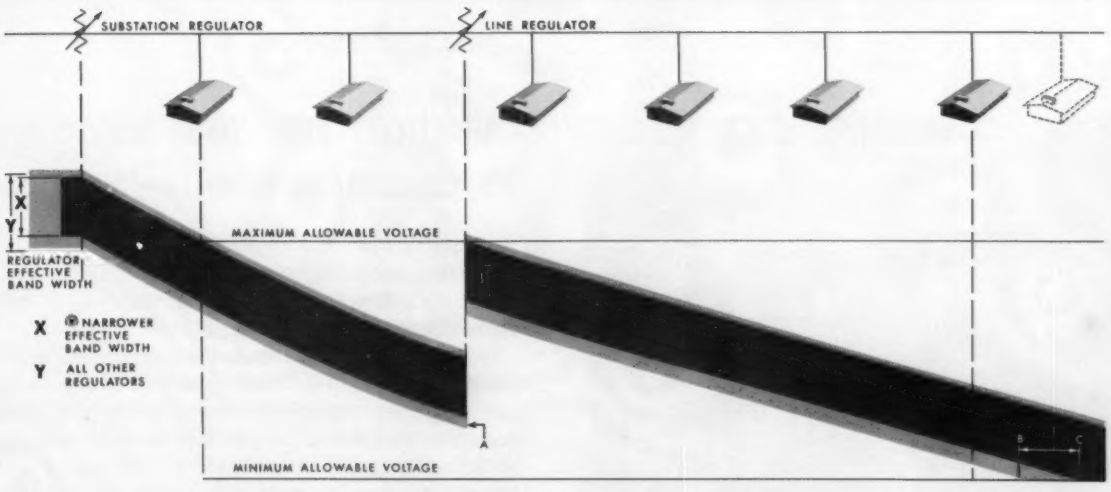
1. Narrowest effective bandwidth.
2. Heavier allowable loading of existing lines, with satisfactory voltages farther out on the line.
3. Protection against sudden high voltages which can damage user equipment.
4. Minimum equipment investment—deferred expansion to meet growing loads.

Features of the new Westinghouse URL and URF step regulators that provide this room-to-grow regulation are:

1. Exclusive—new CVR voltage-regulating relay with integral, adjustable, inverse time delay—reads voltage, evaluates need for correction, eliminates unnecessary tap changes.
2. Exclusive—instant response tap changer mechanism—operates 15 times faster than other types of mechanisms after relay signal.
3. Exclusive—1¼% step regulation covers a total range of 20% in 16 steps—maintains most effective voltage level.
4. Load range selection enabling you to select a range of regulation which matches the load current requirement.

Westinghouse—first with the future—provides tomorrow's regulators today, offering the highest quality of service demanded by today's electrical living—combined with rock-bottom operating expenses.

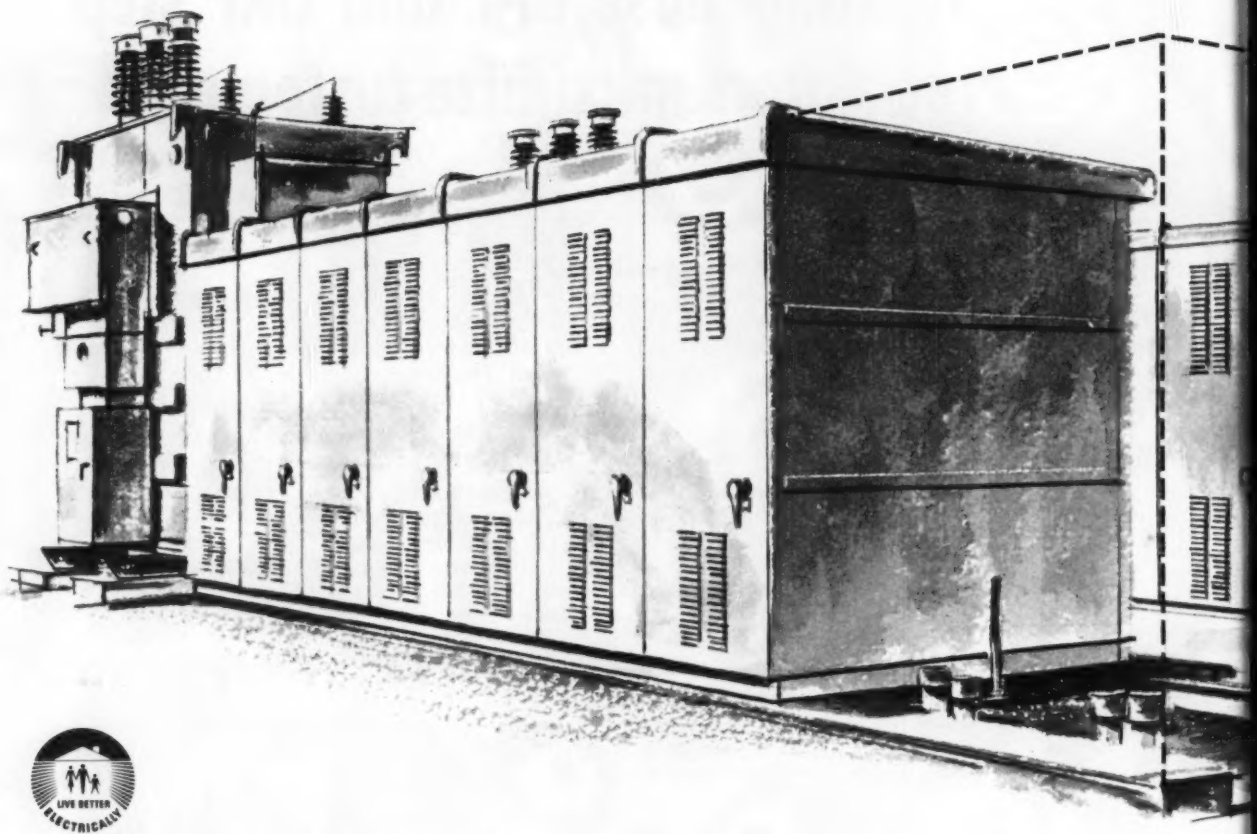
YOU CAN BE SURE...IF IT'S Westinghouse

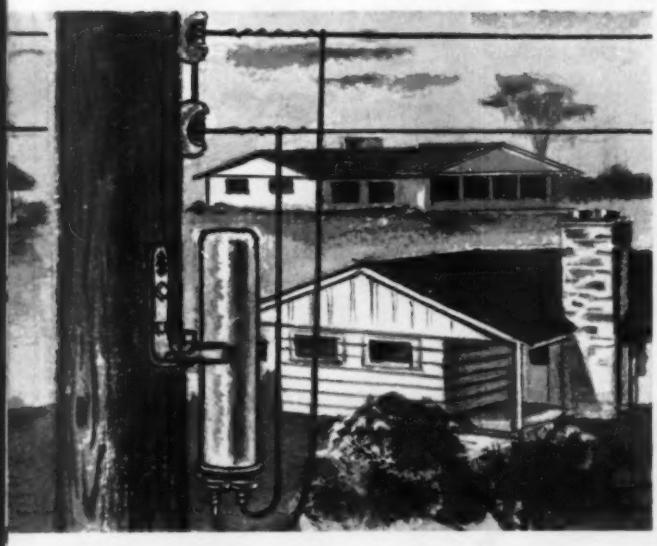


Here's how your new or extended distribution lines can benefit from Westinghouse URL or URF voltage regulators, using 1¼% voltage regulation. At point "A" above, other regulators use more of allowable voltage drop. Exposed gray bandwidth shows extra line drop available for load growth when using Westinghouse regulators. Similarly, distance "B-C" represents additional margin for growth or line extension.

The reason? With 1½-volt steps, Westinghouse regulators maintain voltage closer to balance voltage. In addition, 16-step regulation means 42% fewer operations, 15% less contact erosion, reduced maintenance, longer life.

These unit substations are



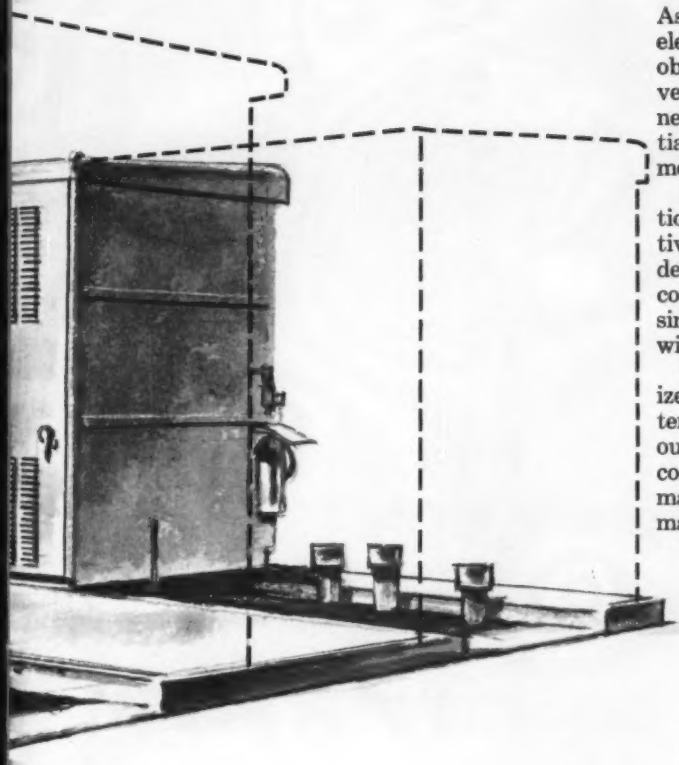


CAPACITORS KEEP YOUR SERVICE TO SUBURBIA EFFICIENT

Keeping up with the Joneses is the well-known favorite sport of Suburbia's population—and that's good—but it calls for sufficient capacity to serve their electrical way of life most efficiently.

Westinghouse Inerteen® secondary capacitors, at ratings of 3, 5, 7½ kvar give you the maximum useful power out of the transformer and to the customer's meter. They are lightweight, easy to install and versatile in application. They mount with either crossarm or pole bracket—terminals up or down. Used terminal leads are already attached. Extruded aluminum case eliminates corrosion and maintenance problems.

designed to grow with suburban development



As Suburbia lives better electrically, it is growing in electrical load—even where physical expansion isn't obvious. Westinghouse anticipated this almost universal distribution problem—designed these "good neighbor" unit substations for great growth potential—but with minimum immediate capital investment.

Standardized metal-clad switchgear makes addition of feeder units economical and visually attractive. Transformers can be soundproofed to lower decibel ratings for less cost—and box-type throat connections make transformer interchangeability simple. Single-end stations can become double-end with minimum installation time and man power.

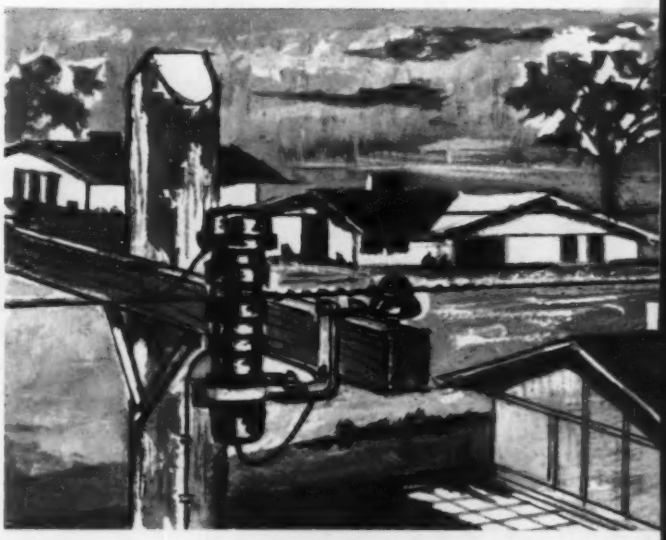
Undercoating and multicoat painting of bonderized, heavy-gauge sheet metal further reduce maintenance, extend life and expansion potential of outdoor metal-clad switchgear. In addition, *all* components are engineered and coordinated by one manufacturer—assuring complete control of design, manufacture and assembly.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

MODERN SUBURBIA NEEDS MODERN ARRESTERS

As Suburbia spreads out, and lines become longer, chances of outages caused by lightning are increased. Westinghouse LV distribution arresters up the odds in your favor against this loss of revenue. The combination of a pre-ionized gap and Autovalve® blocks insures fast action and high surge capacity. The Westinghouse drop-out feature eliminates all possibility of line lockout and gives indication of a damaged arrester. Finally, the moisture-proof seal—pressure tested with dry nitrogen—is proof against radio-TV interference. The field-tested, time-proved LV is typical of the complete line of quality, hard-working Westinghouse arresters.



30-ampere meters measure maximum "Housepower" loads

The longest mortgage in Suburbia will be burned years before the first Westinghouse 30-ampere watthour meter has to be changed.

This Lifetime meter is guaranteed for thirty years. It has its own expulsion-type lightning arrester—discharges the arc outside. It is frictionproofed by sapphire bearings. It has 200-ampere extended range capacity—enough to measure accurately all the load that can be applied to single-phase service.

What's more, it doesn't cost a penny more than conventional 15-ampere rated meters.

This 30-ampere Lifetime meter is another example of designed-in and built-in growth potential available in Westinghouse distribution equipment. Your Westinghouse sales representative can be a real partner in your buying for today—with an advantage for tomorrow. CP1042

YOU CAN BE SURE...IF IT'S

Westinghouse

Street Light Controls

(Continued from page 128)

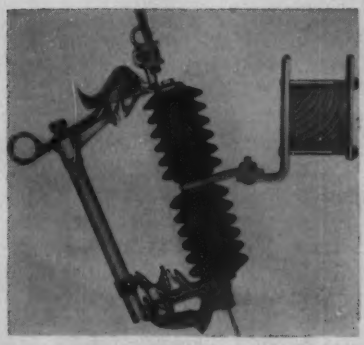
Specially formulated housing is said to provide complete weather protection.

Micro Balancing, Inc, Garden City Park, N. Y.

Utility Truck

Part of the Anniversary line, the Model A-150 medium duty truck is rated at 9,000 to 15,000 lb gvw. Standard engine is rated 141 hp, with 154-hp, 264-cu. in. engine optional. Wheelbases range from 129 to 171 in. Cab is 65 in. wide, has 1,181-sq in. windshield. A light duty truck with service-utility body, the Model A-110, is rated 4,200 to 5,400 lb gvw, with wheelbases from 110 to 126 in.

International Harvester Co, 180 N. Michigan Ave, Chicago 1, Ill.

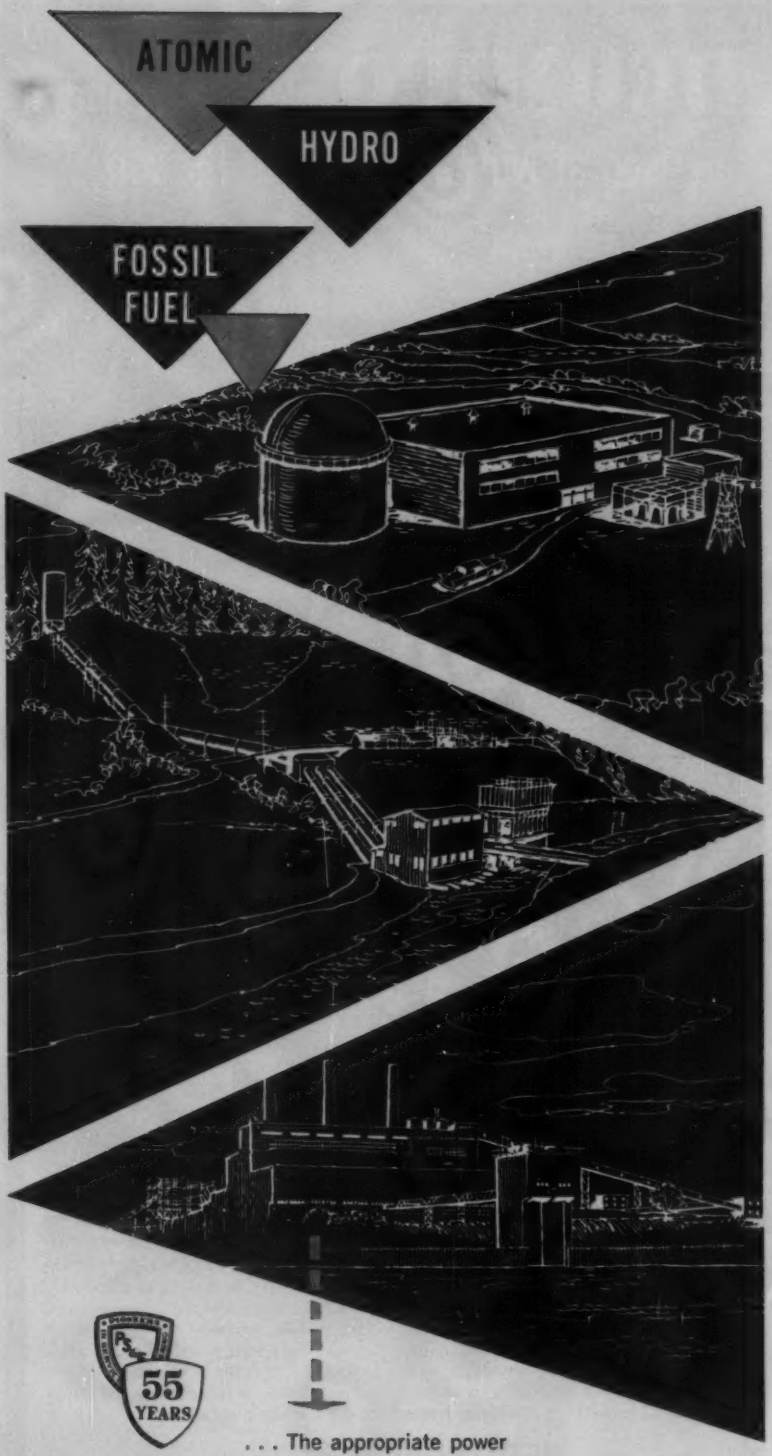


Distribution Cutout

The fuse holder cap of this Type BV-33-F distribution cutout has an expendable disc which remains in place on low faults, restricting gases, but is expelled on high faults, with a double vent for maximum interrupting capacity.

It is available for service at 5,

(Continued on page 138)



55 YEARS

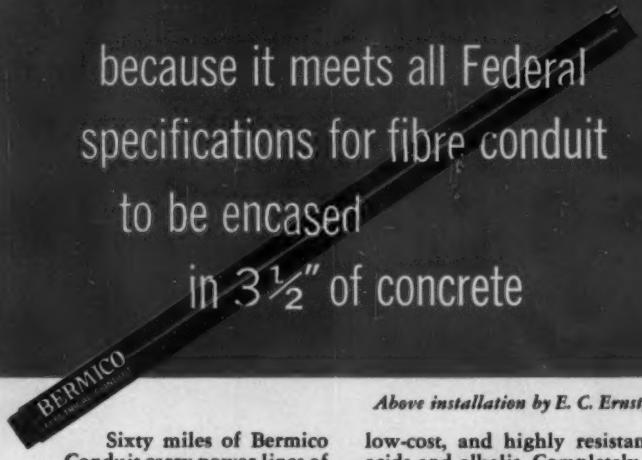
. . . The appropriate power for your expanding program

Send for our descriptive booklet, "Pioneering New Horizons" of these and other services.

Pioneer Service & Engineering Co.
231 South La Salle Street • Chicago, Illinois

BERMICO® electrical conduit used at Norfolk Naval Air Station...

because it meets all Federal specifications for fibre conduit to be encased in 3½" of concrete



Above installation by E. C. Ernst, Inc.

Sixty miles of Bermico Conduit carry power lines of up to 34,000 volts as well as signal lines for communications and supervisory systems at the U.S. Naval Air Station, Norfolk, Va.

Precision engineered Bermico Conduit is made to exacting specifications from cellulose impregnated with pitch. It is strong, light, low-cost, and highly resistant to acids and alkalis. Completely uniform, it installs quickly and easily.

Bermico Conduit is specified by leading electrical contractors and by public utilities from coast to coast. To speed your cable installations . . . specify Bermico Conduit. Immediate shipment of all sizes and fittings guaranteed.

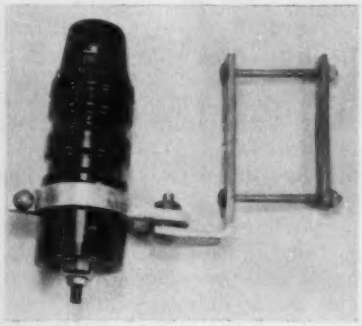
Distributed by WESTINGHOUSE Electrical Supply Company
Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire

Distribution Cutout

(Continued from page 137)

7.5, 15, and 25 kv, with continuous current ratings of 100 and 200 amp and interrupting ratings up to 10,000 rms amp. Operating eye automatically unlatches fuse holder when force is applied with hookstick. Clamp-type terminals take ACSR No. 6 through 10. The cutout is designed for button head links only. It may be converted to single-vented unit by replacing the cap.
Southern States Equipment Corp, Hampton, Georgia



Lightning Arrester

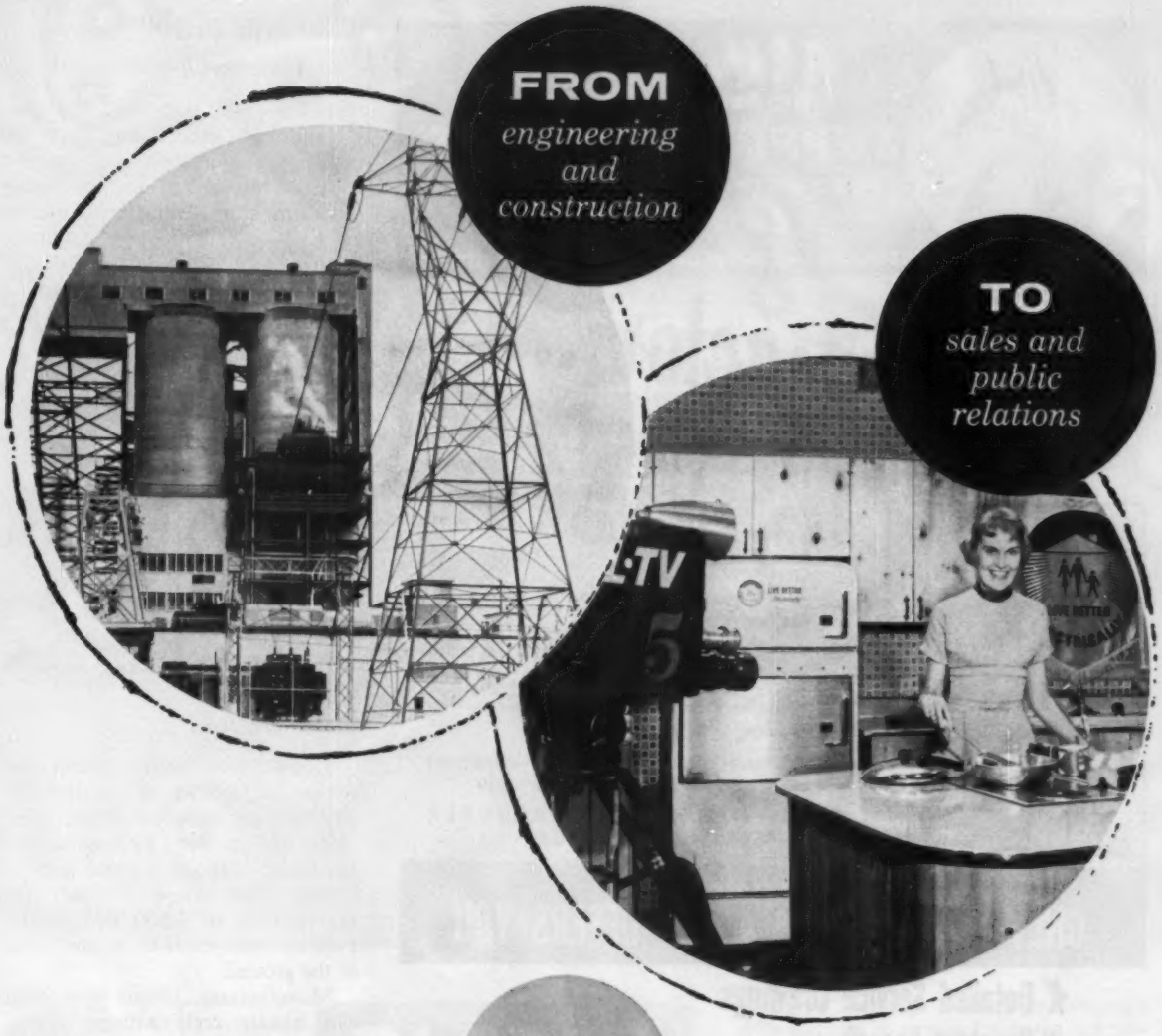
An improved Autovalve lightning arrester for distribution systems with both line and ground studs is available for service at 3 to 15 kv. The new design needs only a one-piece lead from primary lead or cut-out through the arrester line stud to the transformer bushing. Only one lead is required from ground stud through transformer ground pad to ground.

The arrester is said to be light and have small dimensions which permit close mounting to transformer. A polyethylene line terminal cover is supplied; a similar ground terminal is optional.
Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Electronic Drive

The VS Jr. variable speed electronic drive is available in 220-v and 440-v models in sizes from ¾ through 4 hp. Single rheostat control provides speed ranges from 23

(Continued on page 140)



you can count on quality performance

EBASCO offers many consulting services to utilities. All carry the same stamp of quality that identifies the power plants Ebasco designs and builds.

Take Ebasco's sales and public relations service, for example. It's continually helping solve problems for utilities all over the country. As a client, it offers you a constant flow of up-to-the-minute guidance and information, providing a sound basis for your day-by-day sales and public relations operations.

Or when special sales and public relations problems arise, the broad experience acquired by Ebasco's consultants is solid assurance of a practical solution.

For more information about these services, write: Ebasco Services Incorporated, *Sales, Marketing and Public Relations Consulting Dept.*, Two Rector Street, New York 6, New York.

Challenging career opportunities now available for qualified engineers. For further information, write to our Personnel Director.

ENGINEERS · CONSTRUCTORS
EBASCO
BUSINESS CONSULTANTS

Other Ebasco services for utilities include: APPRAISAL • FINANCIAL AND BUSINESS STUDIES • INDUSTRIAL RELATIONS • INSURANCE, PENSIONS AND SAFETY • PURCHASING, INSPECTION AND EXPEDITING • RATES AND PRICING • RESEARCH • SPACE PLANNING • SYSTEMS, METHODS AND BUDGETS • TAX • WASHINGTON OFFICE

NEW YORK · CHICAGO
DALLAS · PORTLAND, ORE.
SAN FRANCISCO · WASHINGTON, D. C.

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

Mr. Contractor...
HUSKY Service Drawings* cuts down Labor Costs

- We make field erection a simple assembly job.
- We can make take off layouts from drawings furnished by you.
- We eliminate guess work with our service drawings.
- We guarantee our detailed layout on basis of drawings furnished by you.
- NO OTHER MANUFACTURER OFFERS SUCH SERVICE.

ONLY HUSKY OFFERS YOU

- Detailed Service Drawings
- Greatest Length
- Fewer Pieces to Handle

Don't COMPARE MATERIAL COST

Do COMPARE INSTALLED COST

* Small service fee on small jobs. FREE on large jobs.

Design and layout assistance available. Unit responsibility assumed. Over 3000 completed installations — Send for free catalog.

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

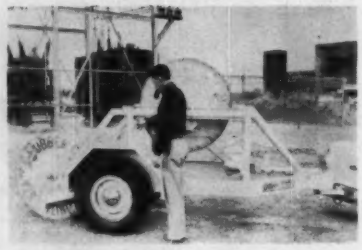
Electronic Drive

(Continued from page 138)

rpm for set-up duty, to 2,300 rpm.

The unit connects directly to the a-c line, requires no m-g sets, d-c lines or mechanical devices. Autotransformer is available for use on 110-, 380-, or 550-v power sources. Unit uses printed circuit board.

Reliance Electric & Engineering Co., 24701 Euclid Ave, Cleveland 17, Ohio



Reel Trailers

Designed to handle spools between 24 and 54 in. in diameter without special attachments, these safety reel trailers include models to handle from one to four reels at a time. They have a maximum lifting capacity of 3,500 lb per reel. Pick-up arms lower to within 12 in. of the ground.

Manufacturer claims one man can handle reels without lifting, danger, or extra expense. A hydraulic winch is optional. Disc-type, 22-in. friction brakes prevent overspin and free wheeling, and provide controlled friction for tension stringing.

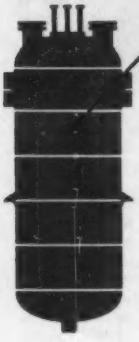
Ottawa Steel Div, L. A. Young Spring & Wire Corp, Ottawa, Kan.

Late Releases

New equipment releases received late. Items will be listed in a coming issue:

Parallel groove clamp, prefilled with oxide-inhibitor. Jasper-Blackburn Corp, St. Louis, Mo.

Maintenance structure, portable, with integral fluorescent lighting. Line Material Industries, Milwaukee, Wis.



PACECO

NUCLEAR
"TAILORS OF STEEL" ®

CAMERA . . . . . ACTION!

The 3⅜" stainless clad steel upper course of this Boiling Water Reactor is completely covered with X-Ray film. The Gamma Ray unit in the center is ready to prove perfection of steel and weld . . . or spot trouble at this stage. This Gamma Ray operation is one essential test, following a Paceco inspection calendar in excess of ASME Code requirements. All plate for the entire reactor shell and heads is completely X-rayed. All welds are fully penetrated. Root passes of all nozzle welds are Magna-Fluxed. And the 17" thick x 9' diameter flanges are ultrasonically tested.

Basic size of this 60 ton reactor vessel was determined by the customer – General Electric Co. Entire design and engineering was supplied by Paceco.

Here are 4 Paceco gained-through-experience skills you may be seeking for design and fabrication of your nuclear equipment:

1. Skill in welding and heat treating of steel and alloys, both light and heavy gauge.
2. Skill in fabricating of corrosion-resistant metals and alloys.
3. Skill in producing heavy equipment to extremely precise mechanical tolerances.
4. Skill in designing and building equipment to resist extreme pressures and intense temperatures.

Some units we have built direct from buyer's plans. In other instances, however, Paceco engineers work with the buyer *at the designing stage*. Experience has proved this consultation may sharply lower initial cost, improve operational efficiency and reduce maintenance. We invite consultation on your requirements.

PACIFIC COAST ENGINEERING COMPANY

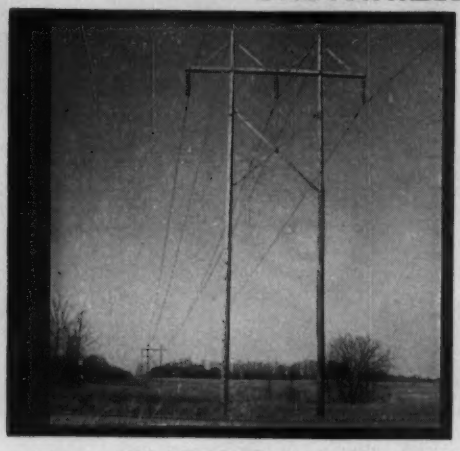
ENGINEERS • MACHINISTS • FABRICATORS

Alameda, California, LAkehurst 2-6100

PACIFIC COAST ENGINEERING CO., INC.
New York 17, 51 East 42nd Street, OXford 7-1475

REPRESENTATIVES
Pasadena 8, Calif., 774 E. Green St., RYan 1-9373
Kansas City 12, Mo., 4706 Holly Street, PLaza 3-3737
Houston 2, Texas, 3619 Robinhood, MOhawk 3504

GALVANIZED STEEL STRAND



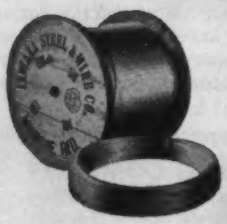
YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .

CRAPO Weldless Galvanized Steel Strand



The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .

Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

CATALOGS—BULLETINS

● **TRANSFORMER MAINTENANCE:** A 50-page booklet entitled "Timely Tips on Transformer Maintenance", written for electric utilities, industrial plants and commercial buildings, is available from Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa. Ask for booklet B-4716-B.

● **LIGHTING FIXTURES:** A catalog of its new lighting fixtures has been issued by Moe Light Division, Thomas Industries Inc, 410 S. Third Street, Louisville 2, Ky.

● **SUBSTATION CONSTRUCTION:** The use of standardized, modular trusses and small parts for the fabrication of electrical transmission substations is described in an 8-page brochure published by Charles E. Schuler Engineering Co, Newark, Ohio.

● **OIL CIRCUIT RECLOSER:** Catalog bulletin CR1W, describing its new 200-Mva Kyle Type W oil circuit recloser, is now available from Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

● **FINE RESISTANCE WIRE:** A 12-page bulletin gives complete technical data on the electrical and physical properties of the principal resistance alloys, Karma, Nichrome, Nichrome V, and Advance, manufactured by Driver-Harris Co, Harrison, N. J.

● **COMPRESSION-CONNECTOR TOOL:** A typical story of how a contractor saved money and time using the manufacturer's MY 29 HYTOOL compression-type connector tool is available in a bulletin from Burndy Corp, Norwalk, Conn.

● **THERMISTORS:** A 10-page bulletin on Glennite Thermistors has been announced by Thermistor Division, Gulton Industries, Inc, Metuchen, N. J.

● **ALUMINUM:** Two brochures on the uses of aluminum in the electrical industry have recently been published by Reynolds Metals Co, 2500 S. Third Street, Louisville 1, Ky:

ACSR and Covered Aluminum Conductor are covered in "Reynolds Aluminum in the Electrical Industry."

Interleaved aluminum strip conductor in electro-magnetic coils, its details and advantages, are covered in "Reynolds Interleaved Aluminum Strip."

● **TRANSFORMER CORE & COIL ASSEMBLIES:** A-C's transformer core and coil assemblies, 3 through 25 kva, 2.4 through 15 kv, for replacement purposes are covered in leaflet 61B6345B, published by Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

● **TIMING MOTORS:** Bulletin Sheet AWH MO 805 contains details on the three basic timing motors made by A. W. Haydon Co, Waterbury, Conn.

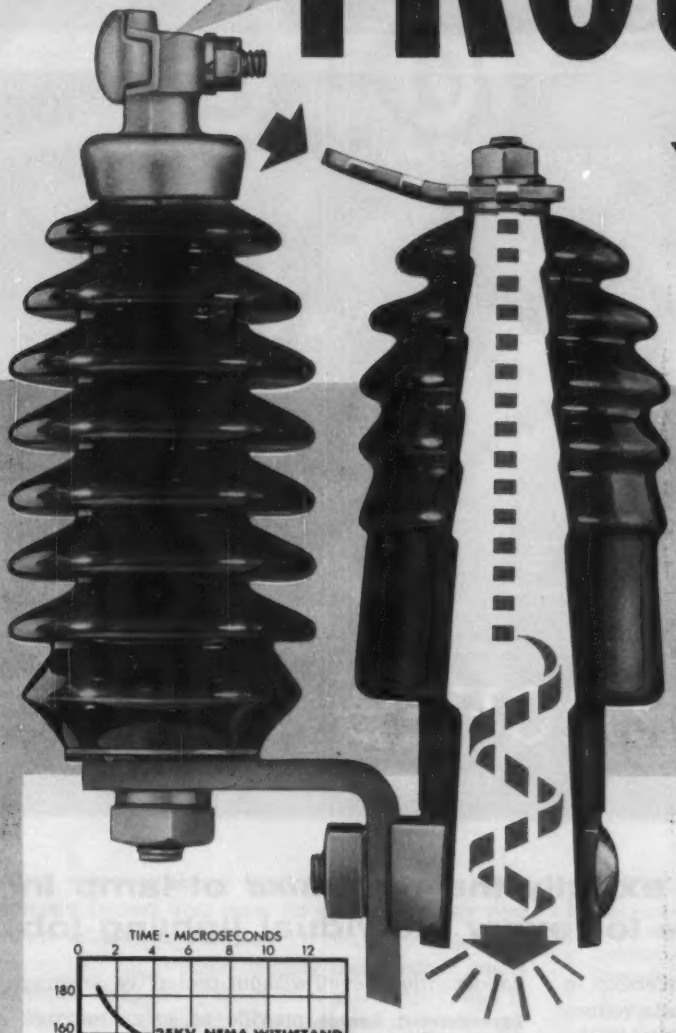
● **LINE GUARDS:** Its Double Arm (A and B) line guards are the subject of a 4-page flyer issued by Bodendieck Tool Co, Taylorville, Ill.

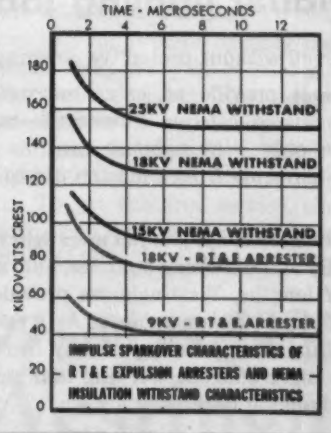
● **PRINTED CIRCUITS:** A booklet entitled "Westinghouse Copper-Clad Micarta Plastic Laminate For Printed Circuits" is available from Westinghouse. It discusses what printed circuits are, their use and advantages. Write Westinghouse Electric Corp, Box 2099, Pittsburg 30, Pa. Ask for Booklet B-6577.

NO *lock-outs • radio-noise • leakage* TROUBLE

with the

Expulsion Type LIGHTNING ARRESTER





Because the RT&E ARRESTER is completely out of the circuit except during lightning discharge—LOCK-OUTS ARE IMPOSSIBLE.

Because RT&E ARRESTER elements are kept near ground potential levels—RADIO NOISE IS ELIMINATED.

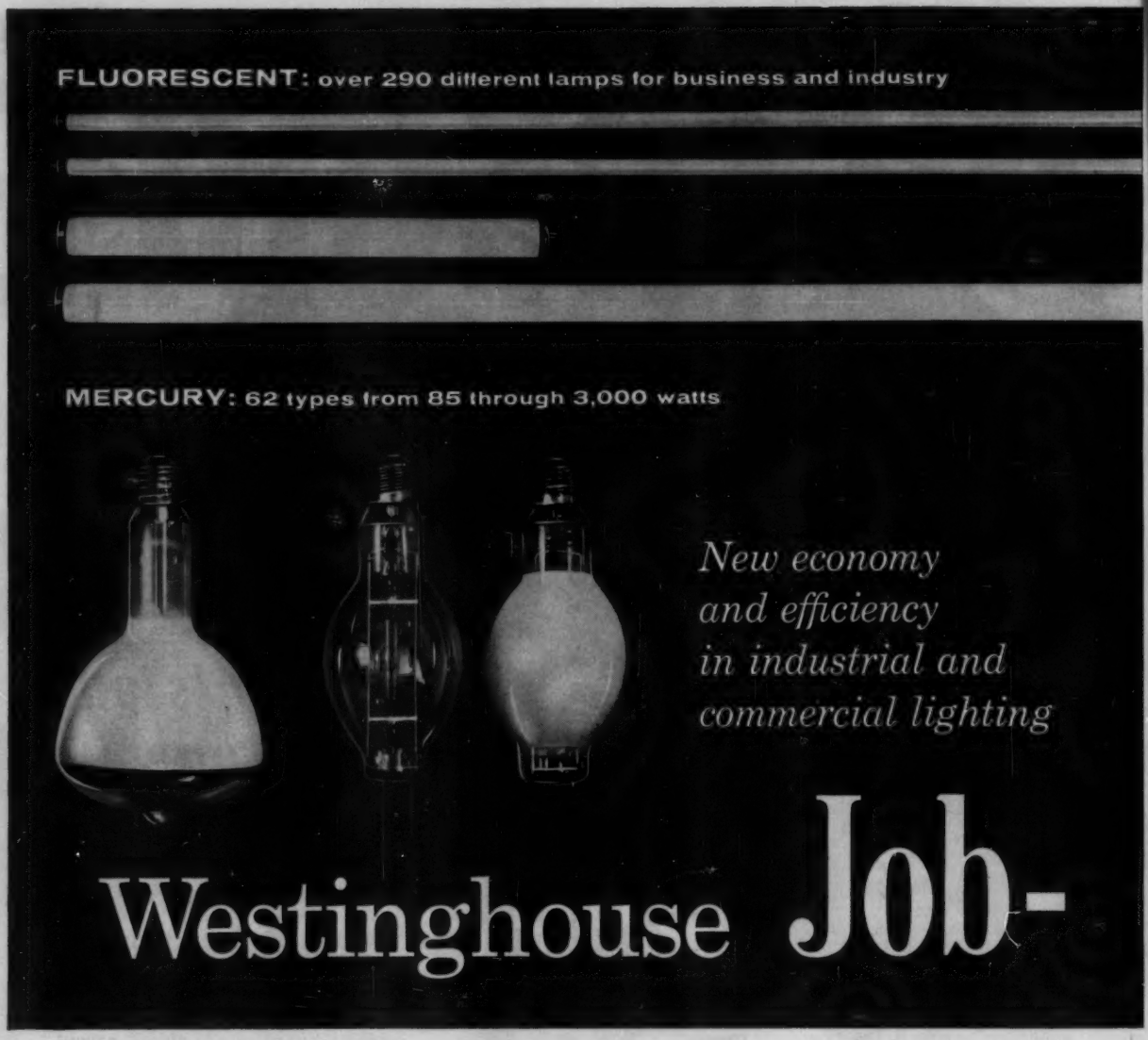
Because RT&E ARRESTER elements are completely isolated from the line—LEAKAGE CANNOT BE PRESENT.

YOU GET TROUBLE-FREE PERFORMANCE PLUS LONG LIFE WITH RT&E LIGHTNING ARRESTERS

RT&E CORPORATION

WAUKESHA, WISCONSIN

Helping provide power for America


FLUORESCENT: over 290 different lamps for business and industry
MERCURY: 62 types from 85 through 3,000 watts
New economy
and efficiency
in industrial and
commercial lighting
Westinghouse Job-

Now you can have exactly the right *kind* of lamp in exactly the right *size* for every individual lighting job

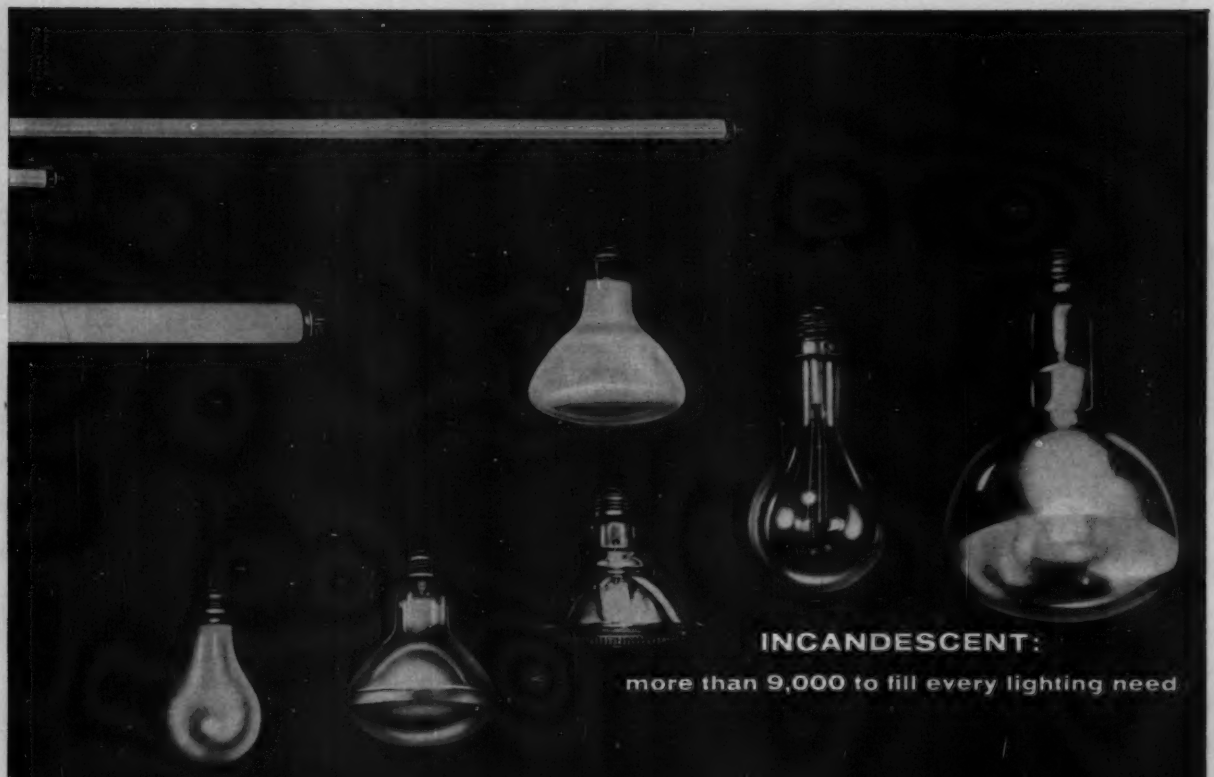
Westinghouse again demonstrates its leadership in lighting with lamps *Job-Tailored* to cut costs, reduce accidents, improve both "See-Ability" and morale. All this is possible because Westinghouse produces more than *10,000 kinds of lamps* with exclusive developments like those below which give you more for your lighting investment.

Fluorescent Lamps, for example, have a new high-intensity phosphor—*Ultralume*™—which gives more lumens per watt plus uniform end-to-end light for the life of the lamp.

Mercury Lamps with special "hard" glass *Weather Duty*™ construction. Can't be harmed by snow, rain, condensation—even without protective coverings.

Incandescent Lamps provide an extra measure of quality with exclusive *Lifeline Filament*™—made possible because only Westinghouse controls the manufacture of filaments from tungsten ore to finished wire.

In addition, Job-Tailored lamps give you more light from existing fixtures. By standardizing on bases, bulb sizes and light center lengths, Westinghouse provides a high degree of *lamp interchangeability*. As a result, with many Westinghouse lamps, you may increase light output to more efficient working and safety levels without changing fixtures.



Tailored Lamps

FREE WESTINGHOUSE JOB-TAILORED LIGHTING SURVEY SHOWS YOU HOW TO GET THE MOST FOR YOUR LIGHTING DOLLAR. To enable you to spot places in your present lighting installations where incorrect lamps may be costing you money, call in a Westinghouse Lamp Representative. With your plant engineer or maintenance supervisor, he will inspect your lighting installation, make a careful analysis of his findings, and report his recommendations. To get this free service, simply fill out the coupon. You'll be dollars ahead with Westinghouse JOB-TAILORED lighting.

YOU CAN BE SURE...IF IT'S

Westinghouse

WESTINGHOUSE ELECTRIC CORPORATION
LAMP DIVISION
Industrial-Commercial Lighting Service
Bloomfield, New Jersey

Please have your Lamp Representative in my area make an appointment with our Mr. _____ to arrange a survey of our lighting needs.

NAME _____

COMPANY _____

ADDRESS _____

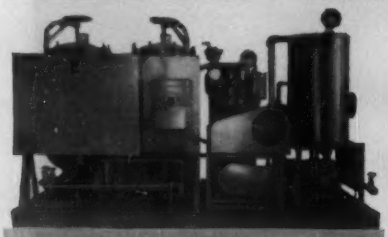
CITY _____ ZONE ____ STATE _____

FULL NAME OF PLANT ENGINEER _____

PHONE NUMBER _____

I am interested in ☐ incandescent ☐ fluorescent ☐ mercury lighting.

CFC PURIVAC®



FULLY
Dehydrates
Purifies
Degasifies
INSULATING OIL
IN ONE SAFE
OPERATION

You can rely on the safety, economy and performance of CFC Purivac — proved again and again by leading utilities — for treating insulating oils used in transformers, power transmission cables, switch gear, and circuit breakers. Purivac *fully* dehydrates, purifies and degasifies in one *safe* automatic operation. Purivac operates at a central reclaiming station or in the field *while electric equipment is in service.*

Some of the outstanding features of CFC Purivac are: centralized control panel; air-tight push buttons and wiring; 110 volt control circuits; fully guarded pump drives; automatically interlocked electrical system — to maintain oil level in transformer, to guarantee full spray vacuum treatment of delivered oil, and to insure against excessive localized heating. With Purivac, all manual lifting is eliminated.

A Commercial Filters Engineer will be glad to demonstrate the advantages of Purivac. Write for technical literature to Department EW.

COMMERCIAL FILTERS
CORPORATION
MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

TECHNICAL LITERATURE

CONVERSION CHART—A reference table for engineers and others in wall chart format contains most of the common conversion factors. Free, write Precision Instrument Co, 3716 N. Milwaukee Avenue, Chicago 41, Ill.

FAN PERFORMANCE—Methods for calculating fan performance from prototype data and methods of prototype fan testing are described in Bulletin No. 151, released recently by the Air Moving & Conditioning Assn. The illustrated bulletin explains how fans are tested to obtain accurate performance characteristics for a complete series of fans of the same design. Copies of "Prototype Fan Testing and Computations for Fan Rating Performance" are available free on request to AMCE, 2159 Guardian Building, Detroit 26, Mich.

EEI PUBLICATIONS—The following publications have recently been issued by Edison Electric Institute. The address is 420 Lexington Avenue, New York 17, N. Y.:

Electric Load System Forecasting, Publication No. 57-3, a report of the System Planning Subcommittee of the Electrical System and Equipment Committee, EEI, covers what its title implies. 20 pages; 70¢ to members, $1.75 to non-members in the U. S., and $1.85 to foreign countries.

Specifications for Dense Southern Pine Crossarms Preservative Treated, TD-91, approved by T&D Committee.

Specifications for Linemen's Climbing Equipment, AP-2, Approved by Accident Prevention Committee.

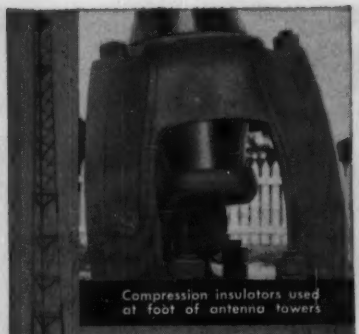
NEMA PUBLICATIONS—The following publications are now available from National Electrical Manufacturers Association, 155 E. 44th Street, New York 17, N. Y.:

NEMA Standards Publication for Industrial Laminated Thermosetting Products, LP 1-1955.

NEMA Standards Publication for Shunt Capacitors, Revision No. 2, dated April, 1957.

LARGE STEAM TURBINES ADVANCES—Advances in the field of large steam turbines is the subject of a booklet based on a paper by C. D. Wilson, chief turbine design engineer of A-C's steam turbine department. The paper was presented before the American Power Conference's 19th annual meeting. The 12-page booklet covers, among other things, the 300-Mw unit for Detroit Edison Co, which is close-coupled, cross compounded; a 250-Mw unit for Wisconsin Electric Power Co; and tandem triple-flow units in the 200 to 250-Mw range operating at 3,600 rpm. It also discusses underslung turning gears for 100-Mw units or larger. Copies of "Advances in the Field of Large Steam Turbines," Bulletin No. 03R8620, are available on request from Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

CORONA—ASTM has issued "Symposium on Corona", STP 198, which attempts to bring together the various practices of manufacturers and users of organic electrical insulation, whose work to date has been largely independent. Purpose of the symposium was to evaluate the stability of insulations in applications where operating voltage gradients approach ionizing levels. Price is $1.25, 32 pages. Address American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.



Compression insulators used at foot of antenna towers

PREVENT ARCING and FLASHOVER DAMAGE with DOW CORNING 5 SILICONE COMPOUND

Dow Corning 5, a grease-like silicone dielectric, maintains a high surface resistivity on porcelain insulators despite contamination by smoke, cement dust, fly ash, chemicals, and other materials.

By preventing the formation of conducting moisture films, this silicone compound gives safe, long-lasting protection against arcs and flashovers. What's more, contamination is easily wiped off silicone coated insulators—reducing your cleaning and maintenance costs to the minimum.

Also an all-weather lubricant for switches, meters and condensers, Dow Corning 5 won't stiffen, freeze, bleed or crack at temperatures from —70 to 400 F.

FREE SAMPLE and full information on request

DEPT. 4417A

DOW CORNING CORPORATION
Midland, Michigan

WHY WORRY about aluminum or bi-metallic connectors?

DO THIS ▼▼▼

1. Wire brush connectors with a...

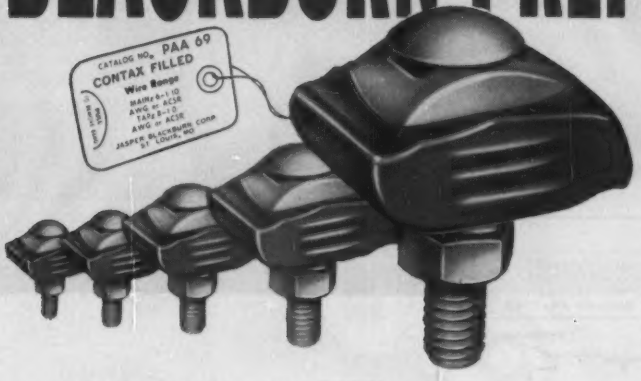
BLACKBURN WIRE BRUSH

with exclusive GLOVE GUARD

- Exclusive guard prevents glove puncture
- Easy grip handle and guard completely covered with durable thermo-plastic coating
- Brush elements can be rotated and are replaceable
- Number WBH-2 furnished with hot line tool adaptor
- Competitively priced

2. Use...

BLACKBURN PREFILLED CLAMPS



PAA, PAC and PGP LINES

Contax liberally applied to each groove at factory, then sealed in. Catalog number and wire range printed on tag. Just wire brush conductor—pull tear string—cover drops off—clamp ready to install. Blackburn Prefilled Clamps save installation time—give you positive assurance compound is always applied to connections.

Available through electrical wholesalers everywhere

JASPER BLACKBURN CORPORATION
ST. LOUIS, MISSOURI

Argonne National Laboratory Experimental Boiling

Electricity from NUCLEAR POWER TODAY!

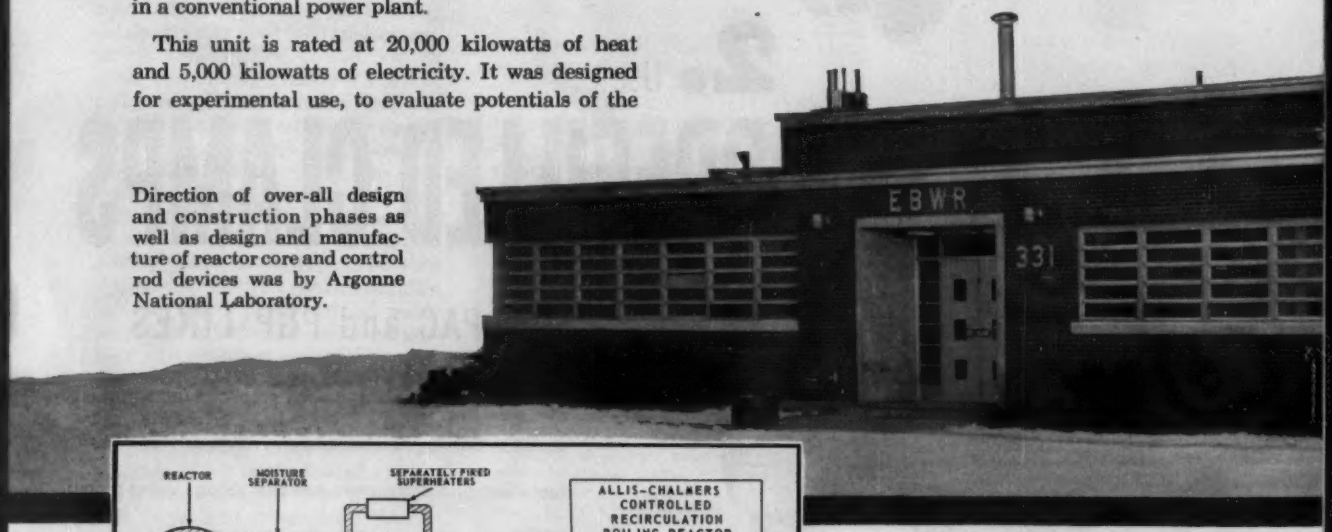
NOW in operation at Lemont, Illinois, this is the first commercial-type power plant in the United States to generate usable quantities of electric power from nuclear fuels.

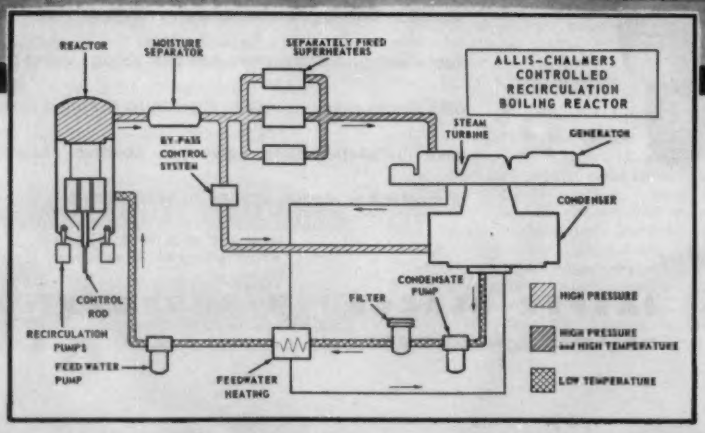
The unique feature of this boiling water reactor is that live steam is actually generated in the uranium core by nuclear heat and piped directly to the turbine without need for intermediate heat exchangers as required by other types of reactors. In effect, it operates very much like the coal-fired boiler in a conventional power plant.

This unit is rated at 20,000 kilowatts of heat and 5,000 kilowatts of electricity. It was designed for experimental use, to evaluate potentials of the boiling water reactor for large-scale commercial applications. Power generated is used by the Laboratory to meet a portion of its own electric power requirements.

Allis-Chalmers is proud of its association with this significant project. It's another example of "Engineering in Action" to provide power for better living from any source, whether it be water, steam, oil, or the atom itself.

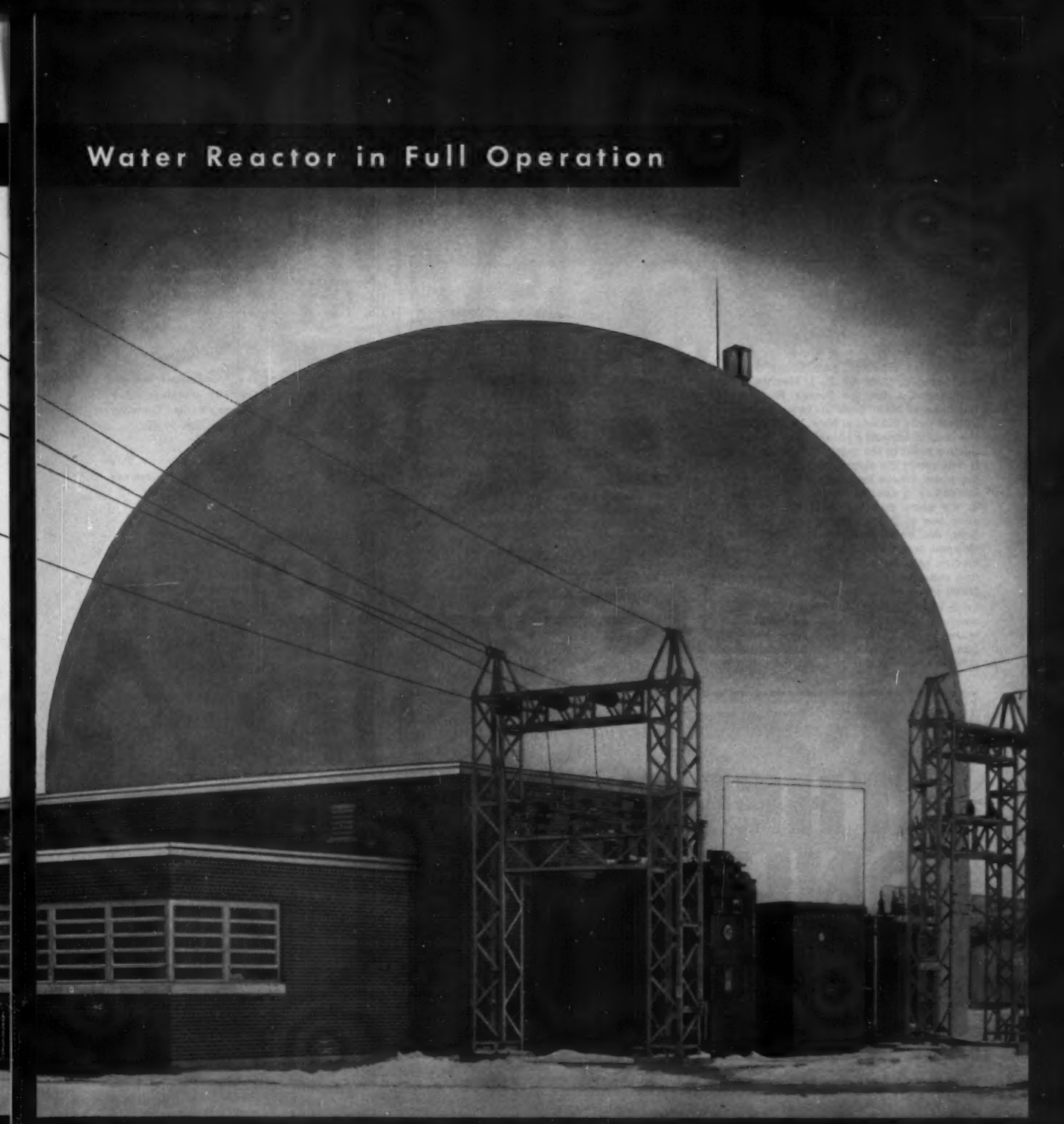
Direction of over-all design and construction phases as well as design and manufacture of reactor core and control rod devices was by Argonne National Laboratory.





CRBR, an advanced type of boiling water reactor now under development at Allis-Chalmers.

Water Reactor in Full Operation



ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

A-5447

ENROUTE TO LONG SAULT DAM

ST. LAWRENCE POWER PROJECT

The first of eighteen gate hoists designed and manufactured by D. J. Murray Manufacturing Co. for the Power Authority of the State of New York St. Lawrence Power Project near Massena, New York, said to be the second largest hydroelectric power producing plant in the world, is shown here as it was ready for shipment from the fabricating plant where the parts were assembled. Loaded on a special length railroad flat car in the same position as it will be placed over one of the eighteen gates in the big dam, the hoist weighs 93,000 lbs. and is shipped completely equipped, including all electric motors, controls and limit switches, and completely wired, ready for operation when installed at the Long Sault Dam.

Each MURCO Gate Hoist has 175 ton lifting capacity and will control the level of the water in the St. Lawrence River above the dam. The electrically operated hoists will raise and lower the gates in the dam at a speed of 1 foot per minute. The overall length of each hoist is 57 feet, the width 8½ feet, and the height 12½ feet. Every two weeks after the first shipment, another gate hoist will leave the plant for its destination.

MURCO Gate Hoists are designed and built in a wide range of capacities from this large capacity to less than one ton. MURCO Gate Hoists have behind them over 70 years of designing and building experience. Write for complete information and engineering recommendations to meet your specific power dam requirements.

D. J. MURRAY MANUFACTURING CO

Manufacturers Since 1883

WAUSAU, WISCONSIN

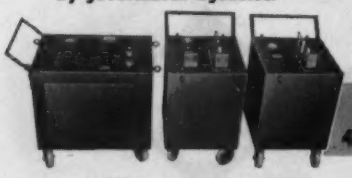
FOR TESTING CURRENT-ACTUATED PROTECTIVE AND VOLTAGE DEVICES, *REMEMBER* . . .

THERE IS ONLY ONE MULTI-AMP®

- Patented MULTI-AMP instruments are widely recognized for outstanding efficiency, unusual compactness and complete safety and dependability.
- MULTI-AMP instruments test and calibrate a wide range of electrical equipment such as relays, switchgear devices, circuit breakers, fuses, etc., for highest possible protection against power outages and fire.
- MULTI-AMP instruments are used by utilities the world over and specified by government agencies.

Here is a representative list:

Public Service Electric & Gas Co.
Philadelphia Electric Co.
Connecticut Light & Power Co.
Delaware Power & Light Co.
Iowa Gas & Electric Co.
Gulf States Utilities
Florida Power Corp.
Western Mass. Electric Co.
Sociedad Electro Mecanica
California-Oregon Power Co.
Indiana & Michigan Electric Co.



Equipment shown is Multi-Amp model 4400/49/61, 40 KVA continuous duty—2 output sections each 4000 Amps at 5V. For additional information request data sheet #5740

MULTI-AMP Corporation
465 LEHIGH AVENUE, UNION, N. J.
Representatives in Principal Cities

BOOKS

Books Received Since Mar. 27, 1957

Transistor Circuits and Applications. By John M. Carroll. Published by McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 285 pages, illustrated. Price $7.50.

Proceedings of the Second RETMA Conference on Reliable Electrical Connections. Published by Engineering Publishers, GPO Box 1151, New York 1, N. Y. 103 pages, illustrated. Price $5.00.

Atomkraft Der Bau von Atomkraftwerken und seine Probleme. By Friedrich Munzinger. Published by Springer-Verlage, Berlin, Germany. 216 pages, illustrated. Price DM 29.40.

Die Transformatoren. By Rudolf Kuchler. Published by Springer-Verlage, Berlin, Germany. 311 pages, illustrated. Price DM 33.

Decentralization Explained

New Frontiers for Professional Managers. By Ralph J. Cordiner. Published by McGraw-Hill Book Co, 330 West 42nd St., New York, N. Y. 121 pages. Price $3.50.

Discusses the problems of the business community, particularly the organizational ones, from the point of view of the head of a large corporate entity. The book is based on a series of lectures delivered by the president of General Electric Co in the spring of 1956 at the Columbia University Graduate School of Business.

The main thesis of the book is a discussion of the effect of decentralization on a large corporation. The author tells why decentralization was considered by the General Electric Co, what were the results of using this type of management organization, and what were the problems encountered in applying decentralization. Also presented is information on long-range planning and decision-making.

Should be informative to those who aspire to management positions.

How to Use An Oscilloscope

The Oscilloscope at Work. By A. Haas and R. W. Hallows. Published by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. 171 pages, illustrated. Price $10.00.

This is a complete treatment of the fundamentals and uses of the cathode-ray tube. A large part of the text and illustrations is devoted to the correct interpretation of oscillograms. Also contained in the book is information on oscilloscope circuits, construction, and adjustment.

This book is an adaptation of a book on the subject originally published in France.

this brand on each pole is your assurance of pole pedigree . . . and guarantee of—

pole protection

Long-Bell pressure-treated poles with creosote or pentachlorophenol

When you specify a pole that carries the Long-Bell brand, you have the result of 78 years lumber experience, over half a century of wood preserving know-how. From vast tracts of timber land in the South and West, carefully selected trees are cut, expertly prepared and deep pressure treated with proven preservatives. Your order is assured of prompt, efficient handling from ample stock at one of five of our conveniently located treating plants.

Poles • Posts • Piling • Cross Arms • Ties • Lumber

INTERNATIONAL PAPER COMPANY
LONG-BELL
DIVISION

Wood Preserving Sales
Kansas City, Missouri • Longview, Washington

Treating Plants: DeRidder, La. Navasota, Texas Joplin, Mo. Weed, Calif. Longview, Wash.

You can see why linemen prefer

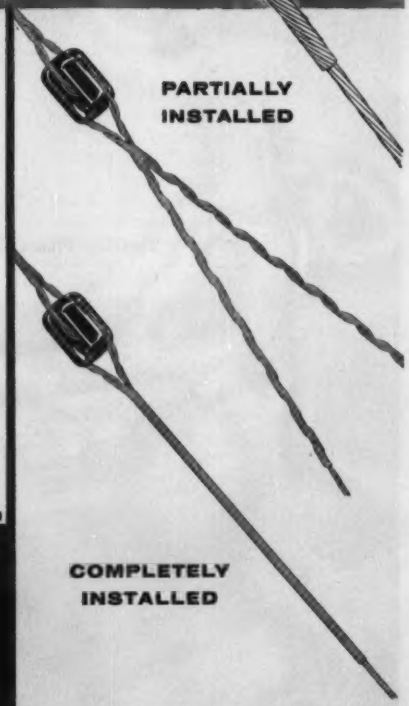
GUY-GRIP Dead-Ends

Linemen are enthusiastic!

PLP GUY-GRIP dead-ends are the easiest, fastest and safest method yet devised for dead-ending strand.

Installation is easy because it takes just one unit, no moveable parts, no bolts or clamps to tighten. It's fast. All you do is hand-wrap the dead-end legs around the strand.

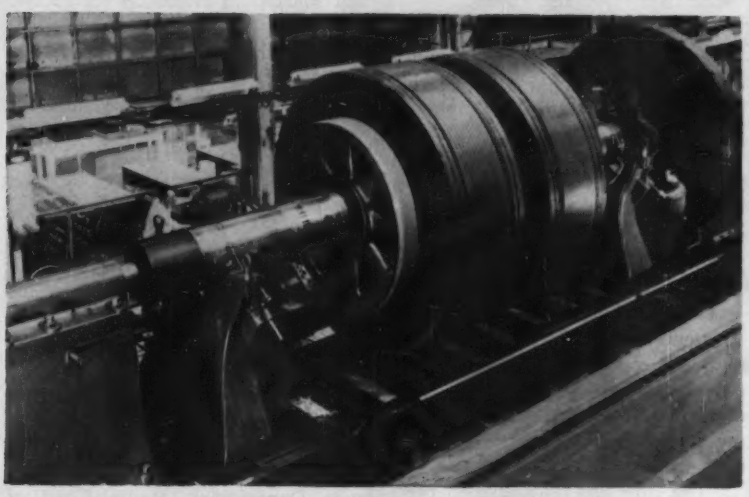
And it's safe. You can see at a glance that the installation is completed and thus secure. Linemen make better time, take pride in their work.
Dept. No. PR1C



PX-81

PREFORMED LINE PRODUCTS CO.
5340 ST. CLAIR AVE. • CLEVELAND 3, OHIO

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.



Huge Lathe Speeds Big Jobs

As part of a $1 million-plus improvement and expansion program at the East Pittsburgh plant of Westinghouse Electric Corp, this huge lathe speeds the production and repair of large electrical equipment. Reported to be one of the largest lathes of its type, it is 50 ft long and is capable of handling jobs up to 15 ft diam.

Shown here is a 104-ton double-armature undergoing shaft refinishing. This armature is part of a rolling mill motor. After nearly a half-century of service, the armature required only surface refinishing of the shaft itself. A precision instrument despite its size, the lathe trimmed less than ten-thousandths of an inch of metal from the shaft, permitting it to be set in its original bearings without expensive modifications. The capacity of the lathe made it possible to do the job without dismantling the armature, a practice usually necessary on smaller lathes.

L&N Welcomes Visitors To Two Places at Once

With plants and offices at two locations, Leeds & Northrup Co, Philadelphia, faced the not uncommon problem of how to help a visitor be sure that he had gone to the correct location for the handling of his specific requirements.

The problem was to design a single publication which would serve both plants, yet avoid putting either plant "first".

The solution was by what might be called a four-panel zig-zag-zig-zig folder. The panel at one end reads "Welcome to North Wales" and the other end panel reads "Welcome to Philadelphia". The supply of publications for each plant is folded with the appropriate panel as a cover, followed by information about the people and facilities located there. The cover panel for the other location is tucked in, out of the way, as the final "zig" fold.

Anyone interested may get a sample of the folder, while they last, by writing J. M. Plummer, Head Public Information Division, Leeds & Northrup Co, Philadelphia 30, Pa.

38-Ft Soot Blower Made by Blaw-Knox for Utility

A 38-ft reach into a boiler tube bank to blow soot is said to be the record distance covered by a Vulcan T-30 retractable soot blower installed on No. 1 boiler in the Meramec Station of Union Electric of Missouri. The blower was built by Copes-Vulcan Division, Blaw-Knox Co, Erie, Pa. No. 1 and 2 are Combustion Engineering boilers.

Performance of this special T-30 lead to the selection of Vulcan T-30 blowers with 36-ft travel, RW-3E wall deslaggers and rotaries for Meramec's new Unit No. 3 soon to be installed.

Unit 3 will be a Foster Wheeler dual-circulation boiler, the first of its kind to be equipped with water-cooled burner throats. It will be designed with steam-cooled walls. Steaming capacity is 1,850,000 lb per hr at 2,150 psig and 1,010F. The unit will be equipped with a total of 54 Vulcan blowers divided into 32 wall deslaggers, 16 retractable units in the convection zone, 4 rotaries in the economizer and 2 swinging-arm type in the air heaters.

This steam generator is to serve a turbine-generator with a nameplate rating of 250,000 kw and maximum capability of 287,500 kw using steam at 2,000 psig and 1,000F.

Fused-Film Wire Made By Inso Products Ltd

A method of coating magnet, lead, and hook-up wire with a thin film of insulation is reported making possible the design of smaller motors and power-operated devices with greater output. This process, known as Fused-Film wire, is used by Inso Products, Ltd, Union, N. J. Inso is a wholly-owned subsidiary of Adam Consolidated Industries, Inc, New York.

In this process, the wire has strip Teflon applied as a film of insulation 0.002 in. thick. Dielectric strength is said to be up to 6,000 v. And tests indicated high degrees of heat, scrape, water, chemical and fungus resistance. The process has been applied to wires. No. 30 solid up to an equivalent No. 6 rectangular.

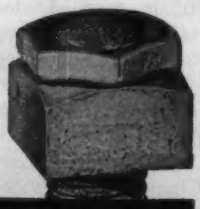
Charles Nixon, vice president of Inso Products, developed the process. Fused-Film wire will be produced by that company in the Gemex plant of Adam Consolidated in Union, N. J.

(More M&M on page 154)

• Eliminate checking and re-tightening
• Eliminate radio interference due to loose hardware

Every bolt-and-nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied — require little space — may be used on new or existing assemblies. Hot dip galvanized, silicon bronze and other materials and finishes. Stocked by all leading pole line hardware manufacturers.

The PALNUT Co.
51 Glen Road
Mountainside
N. J.



PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

Ship Control for First Automatic Steel Mill

Control equipment for what is believed to be the first fully automatic reversing roughing steel mill was shipped from Westinghouse Electric Corp's Buffalo works.

Purchased by Jones & Laughlin Steel Corp, the automatic controls will direct and coordinate operations of a 6,000-hp universal reversing roughing mill at the steel producer's Aliquippa, Pa., works.

The roughing mill will feed a six-stand continuous hot strip mill and will reportedly be the first in the industry to be controlled by a card-programmed system governing every stage of the roughing mill operations.

"The operator will have to push only two control buttons to complete the entire process," Tom Turner, vice president in charge of Westinghouse motor and control division, explained. The first button will transmit production data from an IBM punched card into a transistorized memory storage element. This element has the capacity to remember each phase of the roughing operation and direct a team of controls in the proper sequence of actions.

The operator then will push the second button to start up the mill, Tom Turner added. Controls will do the rest automatically and signal when the roughing operation is completed.

Turner reported, however, that application of the new control system is not necessarily confined to controlling a roughing mill. Additional applications now under development in the ferrous and nonferrous industries include control for the automation of primary and secondary reversing mills for slabbing and blooming.

U. S. Copper Production

Primary copper production in the United States in March was 96,023 tons, according to the Copper Institute, New York. The amount was an increase of over 3,500 tons in February. Refined copper production totalled 143,961 tons, up 9,670 tons over February, and it is the largest monthly amount since May, 1956. Deliveries to fabricators was some 113,570 tons for March, an increase over 12,000 tons from February. Refined copper stocks at the end of March amounted to 140,191 tons, up 3,689 tons from 136,502 tons in February, and the highest for the first three months of 1957.

RCA Talk-Hear-Control Unit Is Miniaturized

A combination talk-hear-control unit, said to be the first of its kind, takes the "desk clutter" out of mobile radio base station installations, according to C. M. Lewis, manager, Communication Products Department, Radio Corp of America, Camden, N. J.

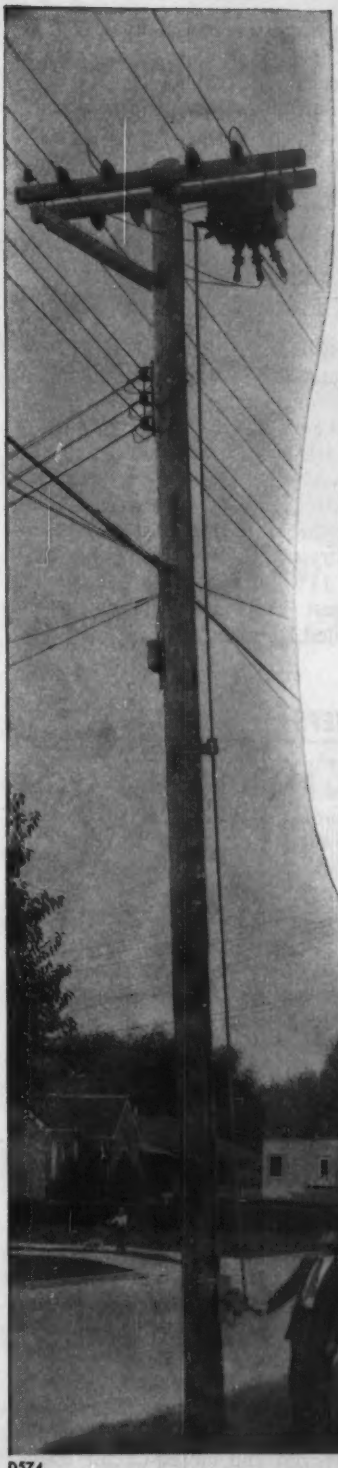
Made possible by transistors and miniaturized components, the RCA unit, known as "Minitrol," combines in a single case a microphone, speaker, and controls necessary for station operation of two-way radio systems. The "Minitrol" unit can be mounted on an adjustable arm over the dispatcher's desk; can be pre-set for hands-free operation; and provides a foot-switch for transmitter operation.

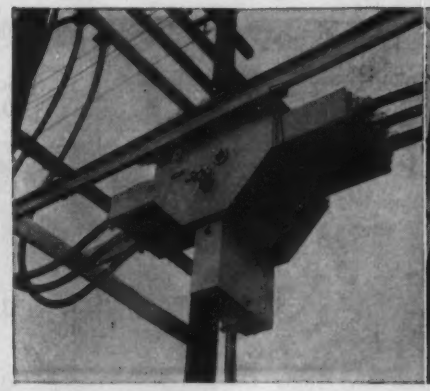
The miniaturized "Minitrol," Lewis said, measures approximately 6 by 2.5 by 2 in. and is only a fraction of the size and weight of conventional radio desk equipment which it replaces. The "Minitrol" device, he said, will become available in June and can be used with all types of RCA mobile radio base station equipment.

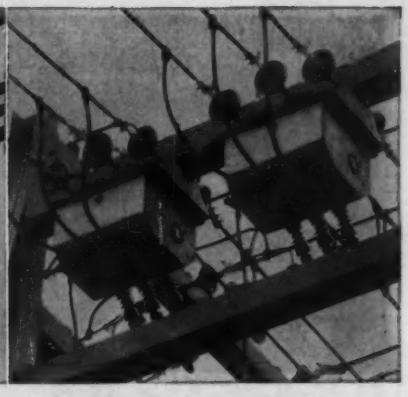
Second Transatlantic Cable

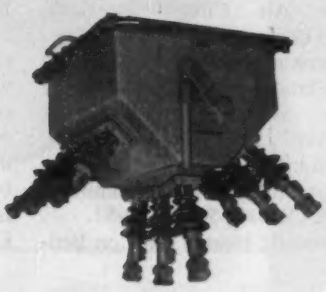
American and British and Canadian officials are discussing the second transatlantic cable to handle the increased traffic flow, according to a report from London by McGraw-Hill World News. A second cable would substantially follow the seabed route chosen for the first system. The first cable, which cost about $42 million went into service in September, 1956 (EW, Oct. 8, 1956, p 59). Since then the number of calls has practically doubled.

(More M&M on page 156)









"ORA" *Single Throw*

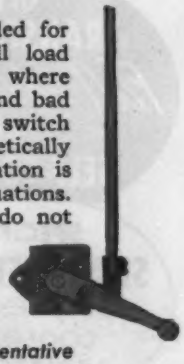
"ORAD" *Double Throw*

for full load break sectionalizing of overhead circuits

***install* G&W TYPE "ORA" OIL SWITCHES**

SWITCHING CONTACTS IN OIL FOR PROTECTION AGAINST CORROSION

Type "ORA" oil switches are recommended for sectionalizing overhead circuits when full load break disconnection is an advantage and where protection against atmospheric corrosion and bad weather conditions is important. With all switch links and contacts oil immersed in hermetically sealed tanks, permanent trouble-free operation is assured under normal and emergency situations. Snow, ice, rain, or temperature extremes do not affect the operation.



400 AMPERES—5 Kv. and 15 Kv.

Write us or get in touch with our nearest representative for further information.

G & W ELECTRIC SPECIALTY CO.

3500 W. 127th St. **BLUE ISLAND, ILL.**

Representatives in principal cities of U.S.A., Mexico and South America
Also manufactured in Canada by Powerlite Devices, Ltd., Toronto, Montreal, Vancouver

D574

G&W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS

NEW WRIGHT
Type "C" Pull-A-Ways
THREE SIZES—1½, 3 and 6-Tons

1½-TON 3-TON 6-TON

FEATURES
• Lubricated for life
• Hooks are drop-forged
• Special alloy-steel chains
• Chain sheaves of drop-forged alloy steel
• Gear teeth cut to precision limits
• Load brake is dependable and safe
• Weights: 1½-ton, 23½ lbs. 3-ton, 36½ lbs. 6-ton, 63 lbs.

ACCO

Write to York, Pa., office for complete information

Wright Hoist Division
AMERICAN CHAIN & CABLE
York, Pa., Bridgeport, Conn.

GIVE TRANSFORMERS Full advantages of SELF-COOLING

SPECIFY SHAW-PERKINS properly designed COOLING RADIATORS

Engineered by specialists to give *any make of transformer* the full economies and trouble-free operation of thermosiphon self-cooling. Design standard for the transformer industry—oval tubes assure optimum heat dissipating surface and free flow characteristics. Valves, flanges, and elbows available for any mounting condition.

Transformer tanks built to customer's design.

Write today for full information
SHAW-PERKINS
MANUFACTURING COMPANY
201 East Carson St. • Pittsburgh 19, Pa.

ASA Reports on Standards in Various Categories

American Standards Association, New York, has reported on the following standards that are underway.

A. American Standards Published:

Schedules of Preferred Ratings for Alternating-and Direct-Current Low Voltage Air Circuit Breakers; C37.16-1956.

Preferred Pickup Calibrations and Trip Delay Settings for Alternating- and Direct-Current Low Voltage Air Circuit Breakers; C37.17-1956.

B. American Standard Approved:

Installation of Pulverized Coal Systems, Safety Code for; ASA Z12.1-1957; NFPA 60A.

C. In Standards Board:

Terms on Facsimile, Definitions of; ASA C16.30, 56 IRE 9-S1.

Electrically Heated Pads on Bedding, Safety Standard for, C33.7.

Glossary of Terms in Nuclear Science and Technology; N1.

D. Withdrawal Being Considered:

Tubular Steel Poles for Electric Line Construction, Specifications for; C13-1926.

UK Electrical Exports Up

British Electrical and Allied Manufacturers' Association, London, has noted that in 1956 the industry broke all records for the amount of electrical machinery and material it was able to export. In its annual report the Association stated: "With a total of £272,500,000, the industry surpassed its figures for 1955 by 11%, and thereby became the largest exporting industry in the United Kingdom.

M & M BRIEFS

H. K. Porter Company, Inc, reports that its wholly owned subsidiary H. K. Porter Company (Canada), Ltd, has acquired Federal Wire & Cable Co, Ltd, Guelph, Ontario. Harold F. Nunn, vice president and general manager of Porters Canadian organization, will supervise the new operation.

Philco Corp, Philadelphia, has developed the Exicon, a color X-ray viewer system that increases the readability of X-ray pictures through the use of contrast enhancement and color TV techniques. First unit will be ready about July 15. Applications are in the medical field as well as in industry for inspection of castings, forgings, and weldings.

Arvin Industries, Inc, Columbus, Ind., marks 25 years in the production of portable electric heaters. Its latest advance is a glass panel heater designed to provide warmth both by radiation and convection.

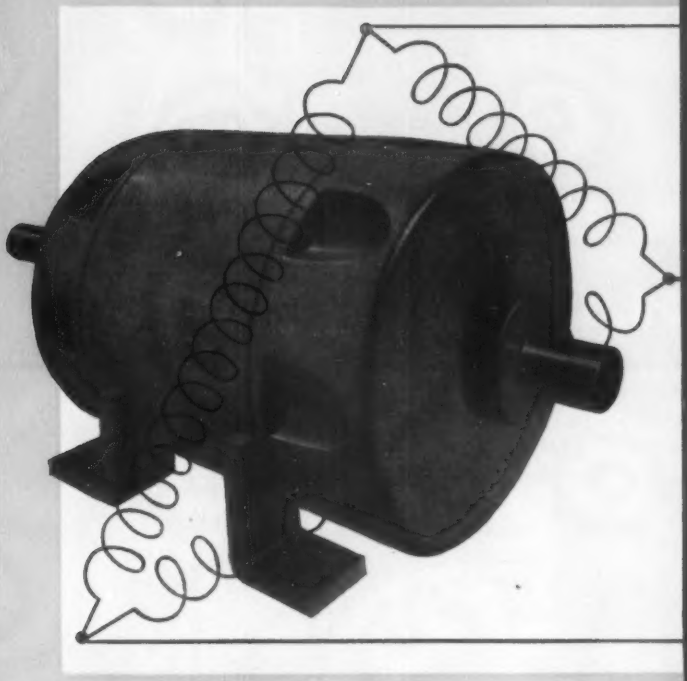
National-Standard Co, Niles, Mich., has developed a copper-coated steel wire reported to meet high tensile strength (up to 250,000 psi), electrical conductivity, bright finsh, and resistance to fatigue and corrosion. Economies reported on the basis of solid copper wire are—low cost, reinforcing strength of steel wire, one-third less poles, less sag and greater resistance to storm and ice damage. Present development is in the communication wires.

I-T-E Circuit Breaker Co's common stock has been admitted to trading on the New York Stock Exchange. Trading started May 7, and the stock opened at $42.50 a share.

REA Magnet Wire Co, Fort Wayne, Ind., reports that construction of a 100,000-sq ft branch plant will be started at Lafayette, Ind. Products are conductors for motors, transformers, coils and other components.

DuMont Laboratories, Inc, Clifton, N. J., has launched a marketing program for a new line of industrial television (ITV) products. Kenneth F. Petersen, manager of the Industrial Television Dept, stated that the industrial and closed-circuit television systems will be sold nationally by local distributors.

UCC—Union Carbide and Carbon Co has plans to start mining titanium minerals next spring on Amelia Island, about 30 miles northeast of Jacksonville, Fla.



SIMPLE DEPENDABLE protection against phase failure and phase reversal

A-B protector

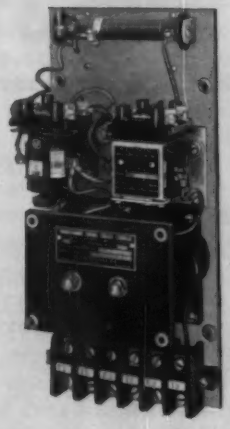
opens control circuit in 3 to 4 cycles...under all load conditions

When men, motors, or the driven machines can be "hurt" by "phase failure" or "phase reversal" . . . the new Allen-Bradley Bulletin 812 should be used as a low cost and reliable "safety" insurance. It detects phase failures and reversals electrically, and within not more than 3 or 4 cycles, opens the motor control circuit—regardless of motor load (including no load)—and thus stops the motor.

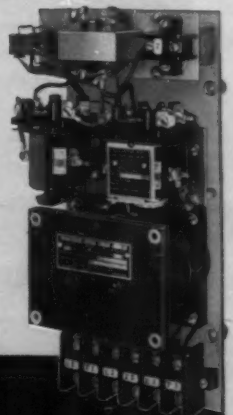
The Bulletin 812 Type A relay protects motors against all phase failures. The Type B relay protects motors against loss of a phase and reversed phase rotation. For the first time, dependable protection is provided for motors supplied by Wye-Delta and Delta-Wye power systems having the neutral ungrounded or not connected to the circuit.

Bulletin 812 relays offer positive protection against motor or machine damage due to opening a primary line—and under all "load" conditions. No field adjustment is required. Remote reset is inherent. Furthermore, as a static device which does not rely for its operation on "motor" revolution the possibility of failure to operate is eliminated.

Bulletin 812 relays are built in four sizes which will reliably protect motors with full load currents from 1.25 amperes to 300 amperes. Let us send you more information about this dependable answer to phase failure and phase reversal problems.



Bulletin 812 Type A phase failure relay protects a 3-phase motor against loss of a phase.



Bulletin 812 Type B phase failure and phase reversal relay protects a 3-phase motor against both loss of a phase and phase reversal.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

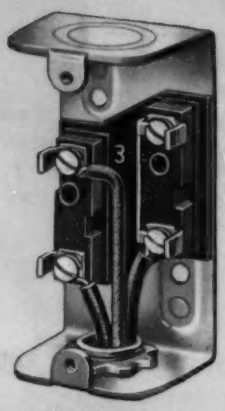
In Canada—
Allen-Bradley Canada Ltd.
Galt, Ontario

4-57-MR

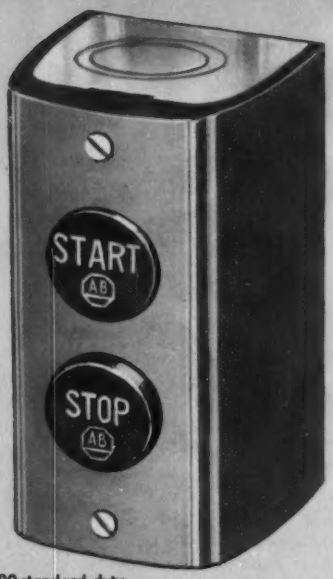
new Allen-Bradley Bulletin 800 Standard-duty Push Buttons

CAN BE WIRED IN HALF THE TIME!

CONTACT MECHANISM IN THE COVER—COMPLETELY PROTECTED FROM CARELESS SCREWDRIVERS AND CARELESS WIRING.



WIRING TERMINALS IN THE BASE —COMPLETELY EXPOSED FOR EASY WIRING.

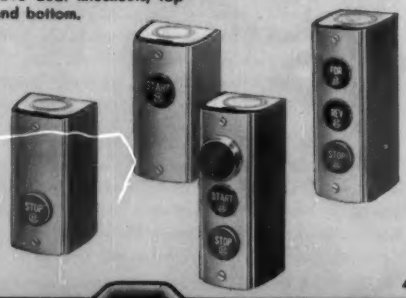


Here's an entirely new idea in push button stations—a wrap-around cover which contains and protects the contact mechanism. Removing the cover exposes all terminals for instant and easy wiring. Heavy, silver plated contacts connect the push button assembly in the cover with the terminals in the base.

Matching ribs in the cover and notches in the molded terminal base eliminate the possibility of having wiring connections made incorrectly. A molded, bakelite shield protects the contact mechanism and prevents careless wiring from interfering with contact operation. All push button contacts are silver and of the double break construction.

Specify the new Allen-Bradley standard-duty station on your next order. Its installation time-saving feature, alone, should make you a regular customer!

Bulletin 800 standard-duty push buttons—with strong, gray, molded cover are "good-looking" and "safe" in operation. All stations have dual knockouts, top and bottom.



4-57-MR

SELECTOR SWITCH

You can't beat this for convenience—a selector switch with the same easy-to-wire construction as the push buttons, shown above—plus the feature that you can change—*in seconds*—from two position to three position (or vice versa)! The correct name plate is furnished with each switch. See for yourself how easily this is accomplished.

CHANGE IT FROM 2 POSITION TO 3 POSITION (or vice versa)...in 30 Seconds!

A-B Quality

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

ELECTRICAL BUSINESS OUTLOOK

Electrical World
MAY 20, 1957

Copper at 32¢ lb is at rock bottom, says Kennecott's C. R. Cox. The company president told stockholders many people believe the price is going still lower. Says Cox: "I don't believe it." About the domestic copper situation, "I happen to be bullish," he adds, even though U. S. sales are lower than '56 and custom smelters are charging 30¢.

Steel spokesmen are not talking about whether there'll be a price hike this summer. They're discussing how much the boost will be. When steel workers get their 20¢ hr boost July 1 watch for a "price increase considerably in excess of the inadequate increase" made after last summer's strike. The quote is from Republic Steel Corp's chairman, Charles M. White. He said higher costs from the coming wage hike justify something more than the $8.50 a ton overage passed on to buyers last August.

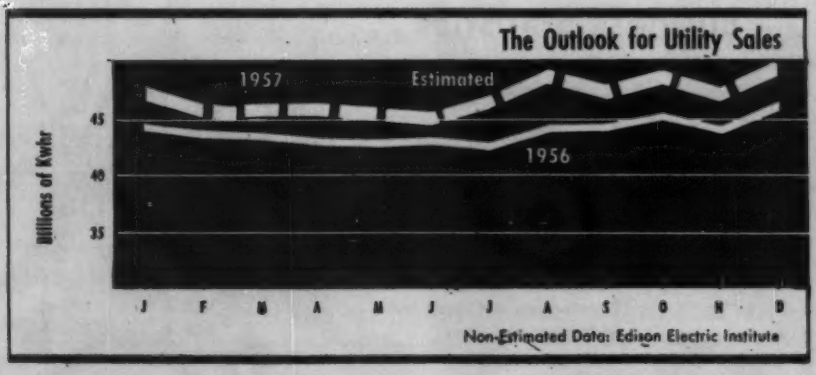
Lead and zinc prices aren't apt to follow suit, though. Uncertainty on government stockpiling, slackening demand are reasons advanced for recent 1½¢ lb drop for zinc and ½¢ for lead. Present prices of 12¢ lb for Western zinc (East St. Louis) and 15¢ lb for lead (New York) are expected to remain firm.

• • •

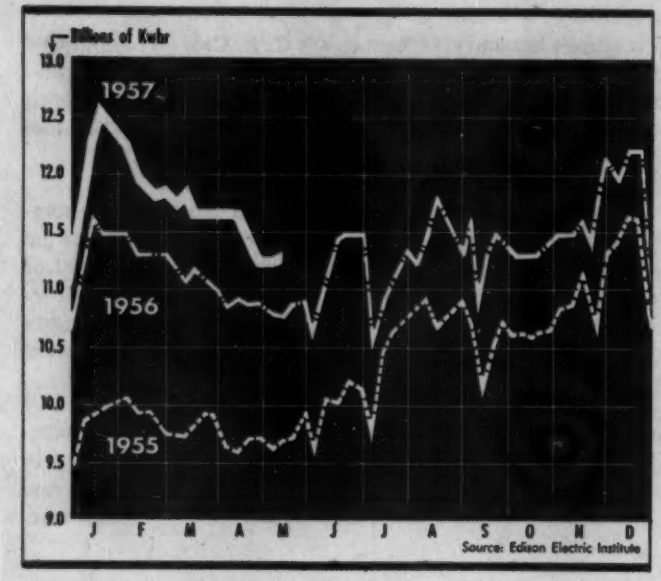
Manufacturing inventories in March rose to $52.2 billion (seasonally adjusted), a slim gain of about $400 million over February. The March figures put an official stamp on what most observers suspected—that the rate of inventory accumulation, which had been tapering off for several months, came to a near-halt in the first quarter. And this means that inventories are playing a more or less negative role in stimulating business.

January to March inventories increase amounted to $800 million compared with $1.5 billion in the same period last year. When price increases are taken into account, that adds up to just about no gain in the volume of goods going through the production pipeline—the raw material, goods in process, and finished goods stages.

With sales generally holding up well, present inventory trends will probably show clear signs of reversing in the third quarter. Industrial production ordinarily picks up in the fourth quarter and is almost certain to do so this year. Manufacturers will begin rebuilding stocks in the second half to prepare for the year-end spurt. And the inventory build-up itself will help spin production wheels a bit faster in the closing months of the year.



STATISTICS



OUTPUT
Week ended May 11, 11,311,000,000 Kwhr Up 4.4%

Per. Cent Change From Previous Year

	Apr. 27	May 4	May 11
Total U. S.	+ 4.1	+4.4	+ 4.4
New Eng.	+ 0.6	+1.7	+ 4.2
Mid. Atlan.	0.0	+3.0	+ 3.4
Cent. Ind.	+ 1.4	+1.8	+ 2.0
West Cent.	+ 3.4	+3.3	+ 5.1
Southeast	+ 5.8	+6.8	+ 7.7
South Cent.	+12.3	+6.2	− 3.1
Rocky Mount.	+ 7.0	+3.1	+ 3.1
Pacific			
NW	+11.1	+5.1	+ 5.2
SW	+ 4.1	+9.2	+12.4

Seasonally Adjusted Index 224.7
Week Ago 224.2
Year Ago 215.3

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 4.6%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Feb.	121.33	121.20	115.59	5.0
Peak—Class 1 Systems. million kw	Feb.	98.8	103.8	94.2	4.9
Estimated Dec. '57 Peak	Feb.	113.5	113.7	113.6	− 0.1
Production—billion kwhr	Feb.	48.67	55.50	47.99	1.4
Hydro		9.98	10.19	10.63	− 6.1
Fuel		38.69	45.31	37.36	3.6
Sales—billion kwhr	Feb.	47.78	49.15	45.41	5.2
Residential		14.25	14.44	13.06	9.1
Commercial		7.49	7.54	6.91	8.4
Industrial		23.65	24.68	23.20	1.9
Other		2.40	2.49	2.24	7.1
Fuel Consumption	Feb.				
Coal—million tons		13.21	15.98	13.44	− 1.7
Oil—million barrels		6.96	9.90	7.10	− 2.0
Gas—million cu ft		83.24	74.77	67.81	22.8
Net Income Class A & B Co's—million	Feb.	142.34	123.86	128.99	10.3
Residential Customers—millions	12 mos.	45.81	45.71	44.50	2.9
Revenue per kwhr	ended	2.59¢	2.60¢	2.64¢	− 1.9
Avg. kwhr per customer	Jan. 31	2,985	2,969	2,778	7.5
Avg annual bill		$77.31	$77.19	$73.34	5.4

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Mar.	148	147	143	3.5
ENR Construction Cost	May	150.0	148.7	144.3	4.0
BLS Cost-of-living	Mar.	118.9	118.7	114.7	3.7
New Orders for Machinery (1950 = 100)	Feb.	161	156	161	n.c.
NEMA Sales					
Insulation materials	Mar.	153	146	168	− 8.9
Electric appliances		97	94	120	−19.8
Wholesale prices	Feb.				
Motors and generators		140.2	40.2	126.6	10.7
Transformers and regulators		146.6	146.6	131.2	11.7
Switchgear and fuses		164.4	164.4	147.5	11.5
GNP—annual rate—$ billion	1st Qtr.	427.0	423.8	403.4	5.9%

MANAGEMENT BULLETIN

FINANCE

More than $85 million new securities were offered by electric utility companies last week. On May 13 Harriman Ripley & Co group won $18 million Central Maine Power Co first mtg 4⅞% bonds (A) due 1987 with a bid of 101.799%; reoffered at 102.799% to yield 4.70% . . . The next day (May 14) Blyth & Co group won $25 million New York State Electric & Gas Corp first mtg 4⅝% bonds (A) due 1987 with a bid of 100.81%; reoffered at 101.55% to yield 4.53%. (For later financing see p 19).

"Bonds are going slow." This was the announcement of Morgan, Stanley & Co group as it began to offer $14.5 million Alabama Power Co first mtg 4⅝% bonds (A) due 1987 at 101.50% to yield 4.53%. Group had won the issue with a bid of 100.6699%.

Two electric utilities sell bonds privately through Kidder, Peabody & Co. The first was a $4.5 million Central Louisiana Electric Co 4⅜% convertible debentures issue due 1969. The other was $3 million Upper Peninsula Power Co 5¼% first mtg bonds due 1987.

New offerings for electric utilities keep coming. Metropolitan Edison Co plans $19 million in bonds; Tampa Electric Co, $18 million; Central Vermont Public Service Corp, 125,000 shares of common stock; and Tampa Electric Co, 217,286 common share offering to stockholders through rights.

RATES

A 7½% rise in electric rates for domestic and commercial consumers will be put into effect on June 1 by the South-East Electricity Board. Increase, first in 18 months, was necessary, reports the Board, to meet higher coal prices, increased wages, and increased charges for electricity by the British Central Electricity Authority.

LEGISLATION

Territory encroachment. Oregon legislature has a bill which would prevent a public utility or a rural electric co-op from encroaching on territory already served by the other.

Florida's publicly-owned utilities may be taxed. Senate has passed and sent to the house a bill which would require publicly-owned utilities to pay taxes on lines and rights of ways in counties outside of their home county.

EMPLOYEE ACTIVITIES

Public Service Co of Indiana and IBEW agree to 6% wage increase effective May 1, 1957, and a further increase of 6% effective May 1, 1958.

A booklet "Adventure in Utility Engineering" by New York State Electric & Gas Corp has just come off the press. If you are interested in obtaining a copy write LeRoy MacLeod, ad mgr, NYSE&G, Binghamton, New York.

Sixth Utility Management Workshop announced. It is sponsored by the Department of Industrial & Management Engineering of Columbia University. It will be held at Arden House, Harriman, N. Y., July 28-Aug. 9. The fee for the program is $800. This covers tuition, research and instructional materials, books, living accommodations, and food. For further information about the course, write Mrs Rae Wygant, 409 Engineering, Columbia University.

UWUA members employed by Cleveland Electric Illuminating Co ratify agreement by a 1,683 to 691 vote (EW, May 13, p 19). The pact provides for improved job security and wage increases ranging from 10 to 15¢ an hour. Increases are retroactive to April 1.

To build better relations with all categories of white-collar workers, National Association of Manufacturers has just published a booklet entitled "Satisfying

the Salaried Employee." It says the more important things a salaried employee wants are: Good supervisors, prestige, chance for growth and advancement, a good salary, security, and congenial environment. For copy write NAM, 2 East 48th St, New York; cost 50¢ a copy with quantity prices on request.

BUILDING COSTS

Atomic costs will still be high in 1960, Howard J. Cadwell, Western Massachusetts Electric Co president, told Northeastern District meeting of AIEE recently. He predicted the Yankee Atomic plant "will cost somewhere between 1½ and 2 times the cost of a conventional fossil fueled steam plant of same size built in 1960."

PUBLIC RELATIONS

A survey report of the status of engineers employed by consulting firms has just been published by the National Society of Professional Engineers. The 40-page report, "Engineers Employed by Private Practitioners," contains information on salaries, hours, geographic distribution of engineer employees, size of the consulting firms, fringe benefits, length of the workweek, and overtime pay practices. Copies of the survey may be obtained for $1 each from the National Society of Professional Engineers, 2029 K St, NW, Washington 6, D. C.

A citation for meritorious achievement in the field of management-shareholder relations has been awarded to Virginia Electric & Power Co for the third consecutive year. Award is given annually by the United Shareholders of America. Citation reads "for encouraging participation in American corporate ownership."

Iowa Southern Utilities Co has retirement magazine. It is known as "The Retirement News." It is published monthly and is mailed to employees who are 60 years of age or over. It offers some good ideas for those who are nearing retirement age. For copy, write George T. Perrine, general sales manager, Iowa & Southern Utilities, Electric Building, Centerville, Iowa.

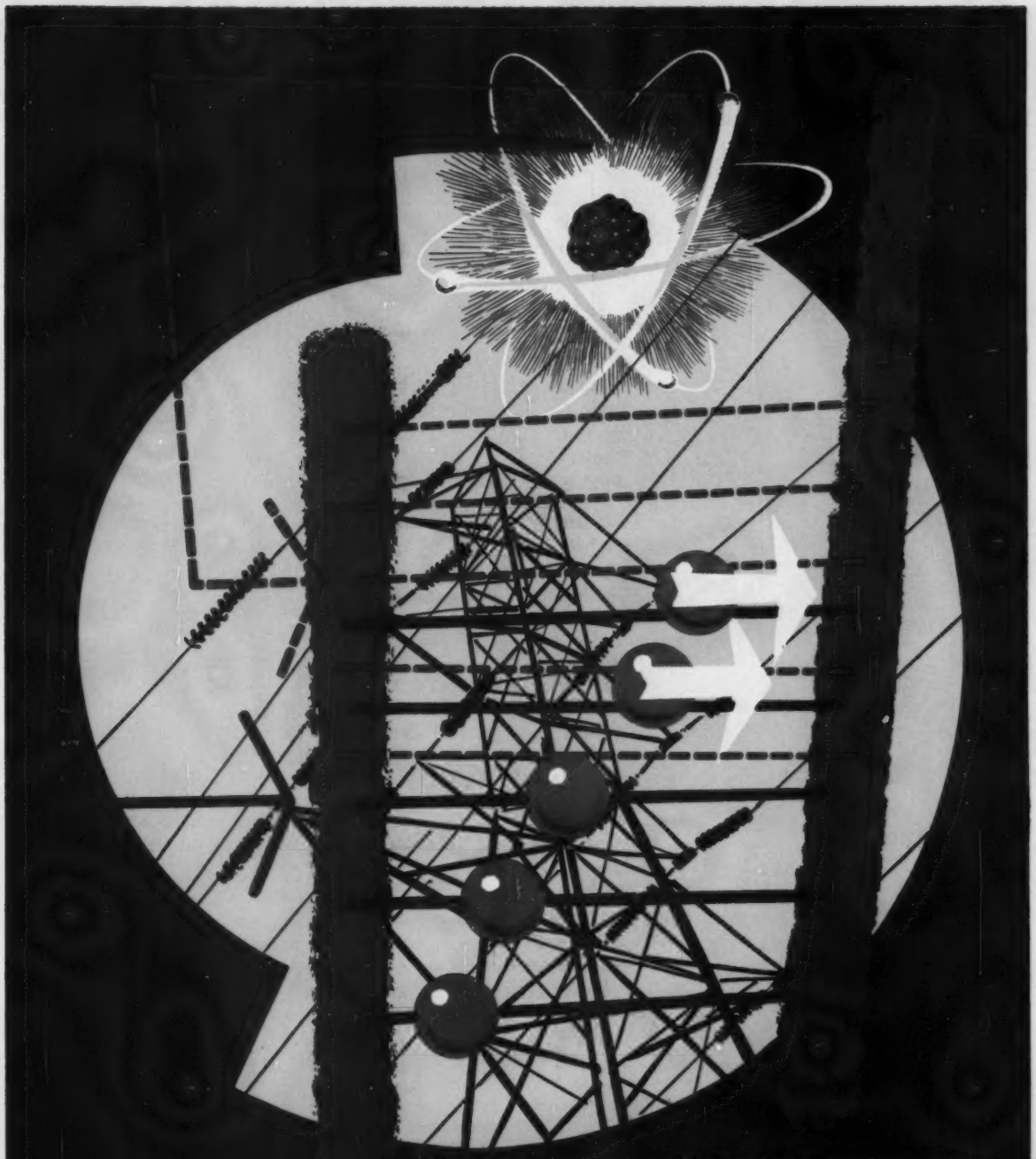
ADVERTISING

Eye-catchers all: Alabama Power Co runs ad with a woman looking at several appliances with the caption "Electric's the Way—Which Shall I Get Next." . . . America's Independent Electric Light and Power Companies have an ad, "The Case of the Missing Millions," which shows a cat in an open safe with a few coins and a bill on the floor. The ad says, "Millions of tax dollars are lost every year through a strange kind of tax favoritism. And you are taxed extra to help balance the loss." . . . United Illuminating Co's ad says: "An Automatic Electric Range Makes Your Cookbooks Come to Life." . . . Comparing the price of electricity with living costs, Philadelphia Electric Co uses an ad which shows a woman looking at a newspaper headline which says, "Prices Soar to New High Levels," and the caption above it reads, "Everything Costs More and More! But I (a picture of Reddy Kilowatt) work for less and less!

ANNUAL REPORTS

Some good ideas are contained in these annual reports that came across our desk recently. Take a look at Alabama Power Co's two-color maps showing hydro and steam facilities . . . Or Arkansas-Missouri Power Co's use of color . . . Or the center spread of Arkansas Power & Light Co's showing the electric system with information on farms, water, climate, minerals, and topography.

Central Power & Light Co dedicated the report to its 40th anniversary . . . Citizens Utilities Co showed interesting charts . . . An employee activities page was setup by the Community Public Service Co . . . El Paso Electric Co presented its financial statements with interesting pictures . . . Georgia Power Co used an interesting slogan, "Men . . . Machines . . . and Materials . . . Building in Georgia."



Experience gained while working on the nation's first and foremost nuclear projects has equipped Stone & Webster Engineering Corporation to meet the challenges of the Atomic Age.

Among the newest projects now being designed and built by Stone & Webster, in partnership with Westinghouse Electric Corporation, is the 134,000 kw Yankee Atomic Power Project at Rowe, Massachusetts – a plant which will bring to New England its first source of electric power from atomic energy.

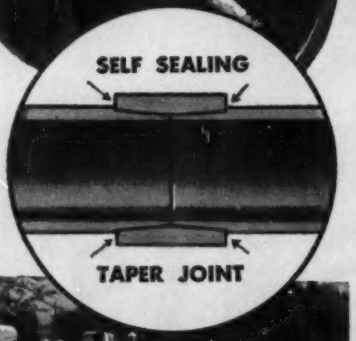
Write or call us for information as to how our experience can be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY of STONE & WEBSTER, INC.

New York • Boston • Chicago • Pittsburgh • Houston • San Francisco • Los Angeles • Seattle • Toronto

SMOOTH BORE!



Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW57A FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

PA's Favor Wider Competition

(Continued from page 79)

sary to pay minimum charges as assessed by a public carrier.

2. It permits less secure packing of materials than that made by public carrier—saving cost of containers, and reducing shipping and packing expenses.

3. Eliminates the cost of furnishing, preparing and attaching thousands of address labels, tags, etc.

4. Eliminates many express receipts and bill of lading forms each.

5. Makes it possible to economically return to the central warehouse any surplus which may accumulate at any point on the system.

6. Eliminates the clerical expense of checking, verifying and paying thousands of small transportation bills each year.

Another method of cutting costs is the use of "unit packaging" in storeroom issues. These are several items packaged together but issued as one item to do a specific job.

Use of Accurate Lead Time

Need for better timing in the purchase of material and equipment was stressed in a report by A. H. Hamilton, Northern States Power Co. He headed a project group studying "Effective use of accurate lead time."

The study indicated that better communications within companies, closer tabs on equipment and materials turnover, and use of commitment buying may offer approaches to cutting inventory expenses. Distribution of dependable lead time schedules for important items of equipment might also help, Hamilton said.

Savings in Packaging Techniques

Packaging and palletization offer tremendous opportunities to reduce or offset overall costs according to a paper on this subject by L. C. Alexander, Cleveland Electric Illuminating Co. These opportunities, he said, include reduction of handling cost, savings of materials and supplies, greater utilization of storage area, greater product protection, reduction of "time in route" and safer working conditions.

To implement these opportunities Alexander suggested that purchasing and stores people must: Take an active and realistic interest in packaging; realize that manufacturers and transportation carriers will also benefit by improved packaging; improve communications on packaging, both among ourselves and with vendors and manufacturers; and finally stimulate our supervisors and other personnel to suggest and be alert for packaging improvements.

Profit from Fly Ash Disposal

In a progress report on fly ash disposal, J. B. Homsher, Gilbert Associates, said coordinated efforts to promote profitable disposal of the substance had been pretty much dormant since an Electrical World conference last year.

Homsher expressed the opinion that this apparent lethargy may have cost the utilities the largest single opportunity for profitable fly ash disposal. For while utilities have been inactive the cement manufacturers have been busily sewing up the multi-billion dollar Federal Highway Program for their product.

However, Homsher added, it still may not be too late to salvage a part of this program. With highway specifications in the hands of the individual states, he said, it is up to individual utilities to sell the value of their product to local state officials. And one way to strengthen the sales story, said Homsher, is for utilities to prove their confidence in fly ash by using it themselves at every opportunity.

One exception to this general inactively is in New England, according to Homsher. There, a number of utilities have set up a fly ash group which, they report, has made some advances.

F. M. Reinhold, Connecticut Light & Power Co, volunteered that his company is a member of this group and is currently selling about 30% of its fly ash production to a construction project in the Boston area. Reinhold sees a potential market that will soon exceed the fly ash supply in this area.

With this in view, Reinhold's company, is currently working on development of a centrifugal separator to increase the percentage of marketable fly ash. A trial installation is expected to go into operation sometime this summer.

POWER
FOR ANY ELECTRICAL REQUIREMENT
• PORTABLE
• EMERGENCY
• CONTINUOUS
Katolight
GENERATORS - POWER PLANTS
Furnish low-cost, efficient Portable, Standby or Continuous power. Your choice of many models. Gasoline, Propane, Natural Gas and Diesel engines of known manufacturers. 350 watts to 500 KVA.
• MOTOR GENERATOR SETS
• HIGH FREQUENCY CHANGERS
Write Regarding Requirements
KATOLIGHT
CORPORATION
Box 891-116
MANKATO, MINNESOTA

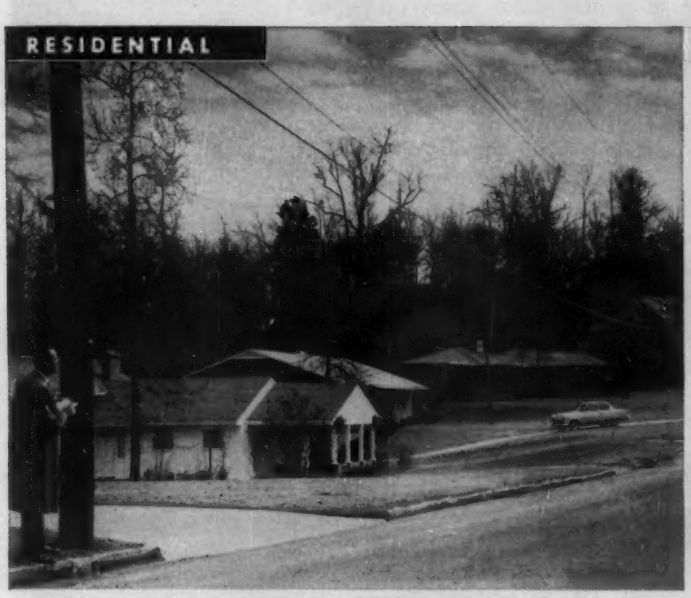
Need a hand-up?

When the next rung on the ladder seems a long way off—that's when Electrical World can really lend a hand. Keeps you advised of the latest technical developments, in touch with fast-breaking industry news, alert to possible future developments, keeps you abreast of industry statistics, legislation, industrial relations—Only "The Electrical Industry's Weekly Magazine" can keep you really *on top of every industry occurrence of importance!*

You read Electrical World regularly, you'll see what we mean . . . and so will your boss! Electrical World, 330 West 42nd St., New York 36, N. Y.

GEORGIA POWER

builds load by



To keep up with Georgia's growth, Company buys over 30,000 pressure-creosoted poles a year

Georgia Power Company purchases in excess of 30,000 pressure-creosoted poles per year to extend its 18,024 miles of present distribution lines. The system is 100% pressure-creosoted; there are more than 430,000 pressure-creosoted poles in service.

In industrial areas, these pressure-creosoted poles not only carry the lines themselves, but the street lighting fixtures and heavy-duty transformers as well. Pressure-creosoted poles give between 20 and 25 years of life.

COMPANY

attracting new industry to state

THE POST-WAR YEARS have brought Georgia more large manufacturing plants than any other state in the Southeast, and the fourth largest number in the entire nation. Georgia Power Company has been doing its part in encouraging these companies to locate in its area.

Georgia Power offers a full consulting service to industry planning to locate there. The company also runs advertisements in national publications and distributes brochures that dramatize the natural resources, labor advantages and, not least of all, the inexpensive, dependable power the company offers to industrial newcomers. One of the major features stressed, in addition to low-cost power, is the low cost of construction.

Since the end of World War II, 3,300 concerns have established manufacturing plants in Georgia. To keep pace with this phenomenal growth, sales of industrial electricity have increased from 1,723,664,355 KWH in 1949 to 2,878,895,477 in 1955. The residential and commercial uses of electric power have increased proportionately to the industrial usage.

If you would like more information on pressure-creosoted utility poles, and the way they can enable you to save money and establish better service for your utility, just get in touch with the nearest Chemical Sales Office of United States Steel or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

UNITED STATES STEEL USS CREOSOTE

CREOSOTE'S PAST ASSURES WOOD'S FUTURE

USS CREOSOTE

Sales Offices in Pittsburgh, New York, Chicago, Cleveland, Salt Lake City, and Fairfield, Alabama

UNITED STATES STEEL

Niagara Mohawk Names 6 to VP Positions

STRATTON

OSTA

WRAY

Niagara Mohawk Power Corp has advanced Vice Presidents R. H. Stratton and Frank T. McEvoy to new vice presidential positions and elected as new vice presidents Storrs M. Bishop, Frank M. Osta, Arthur W. Evans, and A. Floyd Wray.

Stratton, who has been vice president-commercial operations since 1953, now becomes administrative vice president. In this capacity he will be chief executive of the Eastern Division. During his 31 years with the system, he has also been lighting and power sales engineer, district manager, and executive assistant to vice president-commercial activities.

McEvoy comes to his new post of vice president-commercial operations after serving as commercial vice president, Eastern Division, since 1950. He will direct system commercial, publicity, and advertising operations. His previous experience with the system, which he joined in 1915, includes traffic manager, purchasing agent, and resident district manager.

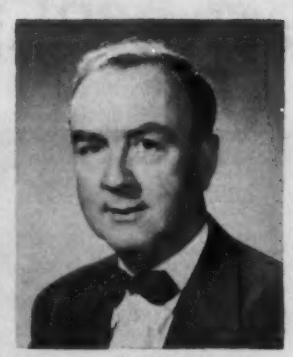
Bishop, former secretary, has been elected commercial vice president. As such he will be in charge of commercial operations in the Eastern Division. Since joining the company 31 years ago, he has also been power sales engineer, district manager, and assistant secretary.

Osta, director of employee relations since 1950, assumes the post of vice president of employee relations. During his 24 years with the system he has also been attorney and associate counsel.

Evans, as a vice president, will be in charge of industrial development, stockholder, and investor relations. He has served as an administrative assistant since 1954.

Wray, a 32-year system veteran, rises from manager of commercial operations for the Central Division to commercial vice president. In his new position he will have responsibility for commercial operations in the Central Division.

In addition, John G. Benack, former assistant secretary, was named secretary, and Edmund J. FitzGerald becomes assistant secretary and continues as office manager.



McEVOY

BISHOP

EVANS

Cooper Is Elected Vice President

The board of directors of California-Pacific Utilities Co has elected Lloyd E. Cooper as vice president.

Cooper, who has been rate engineer and gas engineer for the company for three years, will direct negotiations in connection with purchased power and purchased gas rates. He will continue to be responsible for engineering and operating problems related to gas operations.

Before he joined California Pacific in 1954, he was with California Public Utilities Commission and Pacific Gas & Electric Co.

LLOYD E. COOPER

Rome's lightweight Triplex goes up much faster than open-wire service drops

Reduce your service-drop installation time—even by a few minutes—and you save money. Now it's possible to speed up practically every job.

High dollar savings. Rome's aluminum Triplex can be installed much faster than open-wire service drops. Multiply the time it saves by the high cost of keeping your crew on the job, and you'll see how great the savings are in manpower costs alone.

Why such savings are possible. The lightweight construction of Rome's aluminum Triplex is behind these important savings. This single-cable assembly weighs less than conventional copper three-wire service drops, so it's easier to handle and quicker to install.

Rome's aluminum Triplex offers simplicity in construction. A self-supporting cable, it consists of specially insulated power conductors spiralled around a "straight-away" neutral conductor. Less handling is required to pull it off the truck, string it, and connect it than conventional three-wire service drops.

You can purchase this economical service drop cable in handy 500-foot cartons, paper-wrapped coils, or on non-returnable reels.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 366-B and ask for Bulletin RCP-361. Rome Cable Corporation, Rome, N. Y.

Plus these benefits!

Costs Less. Initial cost is lower than conventional copper Type SD service drop cable.

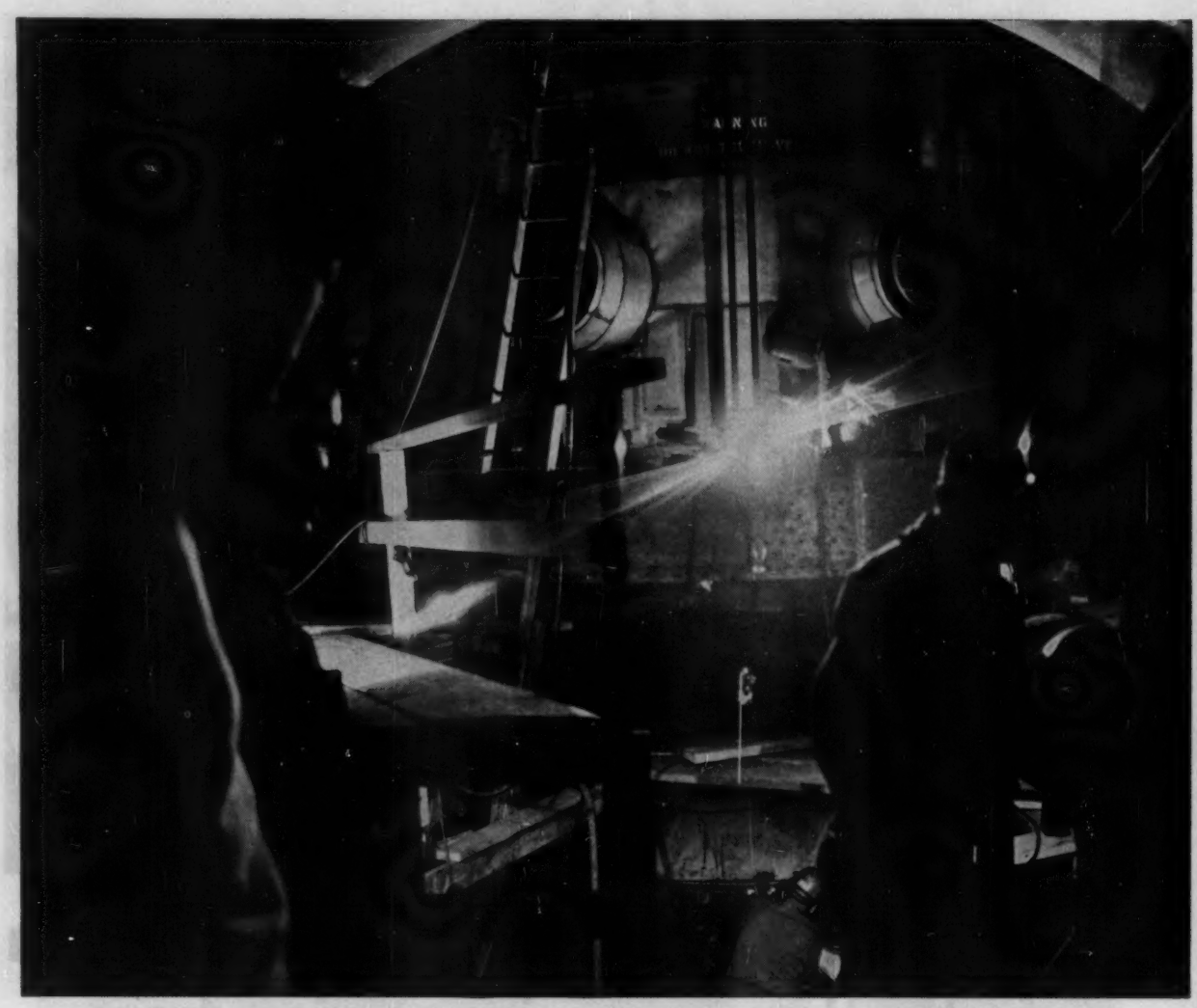
Lasts Longer. Maintenance and service interruptions are few compared to open-wire installations. It offers maximum resistance to storms, wind and ice loading.

Fewer Poles Required. Fewer poles are required and longer spans are possible with mid-span taps on secondary Triplex.

Less Hardware Needed. Service tap connections at the pole require less hardware than a conventional three-wire tap.

ROME CABLE

CORPORATION



Photos by Robert Yarnall Richie

Rome's station control cable installed

Artist's Sketch of first U. S. full-scale atomic-electric plant. This revolutionary power plant—under the operation of Duquesne Light Company of Pittsburgh—will be delivering electricity to home and industry in the Pittsburgh area late this year or early next.

Atomic-Electric Power will be controlled from this large cabinet installation at the Shippingport atomic power station. Nearly ten miles of Rome's highest quality station control cable were used in this vital system.

Partner to the Atom. Rome's control cable is here being installed in the nation's first major atomic power plant at Shippingport, Pennsylvania. Rome Cable furnished over 50,000 feet of station control cable for this important installation.

in Shippingport atomic power station

This country's first full-scale atomic power plant for the generation of electricity will contain almost ten miles of Rome's highest quality station control cable.

The selection of Rome's Rozone-Roprene cable—with a special over-all asbestos outer braid—for this epoch-making installation was no accident, for individual Rozone insulated-Roprene jacketed conductors represent the ultimate in control cable design and performance.

Advantages of Rozone insulation. Rozone—a high-quality oil-base compound—is an excellent insulation. Long and widespread experience has proved that its high-dielectric and impulse strength, combined with its resistance to corona and ozone cutting, makes it an ideal insulation for control and high-voltage power cables. Its electrical properties are practically unaffected by long-time immersion in water or burial in the ground.

Advantages of Roprene jacket. Roprene—a neoprene synthetic rubber compound developed by Rome Cable—provides an extremely durable and permanent mechanical protective covering for the individually Rozone-insulated conductors. It assures terminations that are resistant to abrasion, weather, and attack by chemicals and oils. And it is exceptionally resistant to fire.

Additional fire protection for this particular cable included a special over-all asbestos outer braid.

Specify premium-quality Rozone-Roprene control cable for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 802, Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

Worthington Makes Executive Appointments

SCHWANHAUSSER

FELDMANN

Worthington Corp has announced the election of Walther H. Feldmann as new president of the company. He succeeds Edwin J. Schwanhausser who becomes vice-chairman.

Feldmann has served as executive vice president since 1955. He began his association with the company in 1944 when Electric Machinery Manufacturing Co, of which he was president and general manager, became a part of Worthington. In 1950 he was elected to the post of vice president in charge of sales at Worthington. He has been a member of the board of directors since last September.

Schwanhausser, former president, has held various executive positions since joining the firm in 1915. They include works manager, vice president, vice president of sales, and executive vice president.

Jewell and Wells Promoted by Westinghouse

Westinghouse Electric Corp has announced the appointments of James H. Jewell to the new post of vice president of marketing and of Robert L. Wells to manager of the atomic power department.

Jewell, vice president of sales since 1949, will now assume direction of the new distribution services department, a system of depots and distribution centers for handling company products. He will continue his responsibilities for sales, advertising, market research, and sales training and planning.

In his new capacity Wells will head the department formerly known as commercial atomic power activities. This department is concerned with the development, design, and sale of all commercial nuclear reactors. He formerly served as executive assistant to the vice president of the Aviation Gas Turbine Division.

JEWELL

WELLS

Infilco Officers Are Named to New Posts

ENGEL

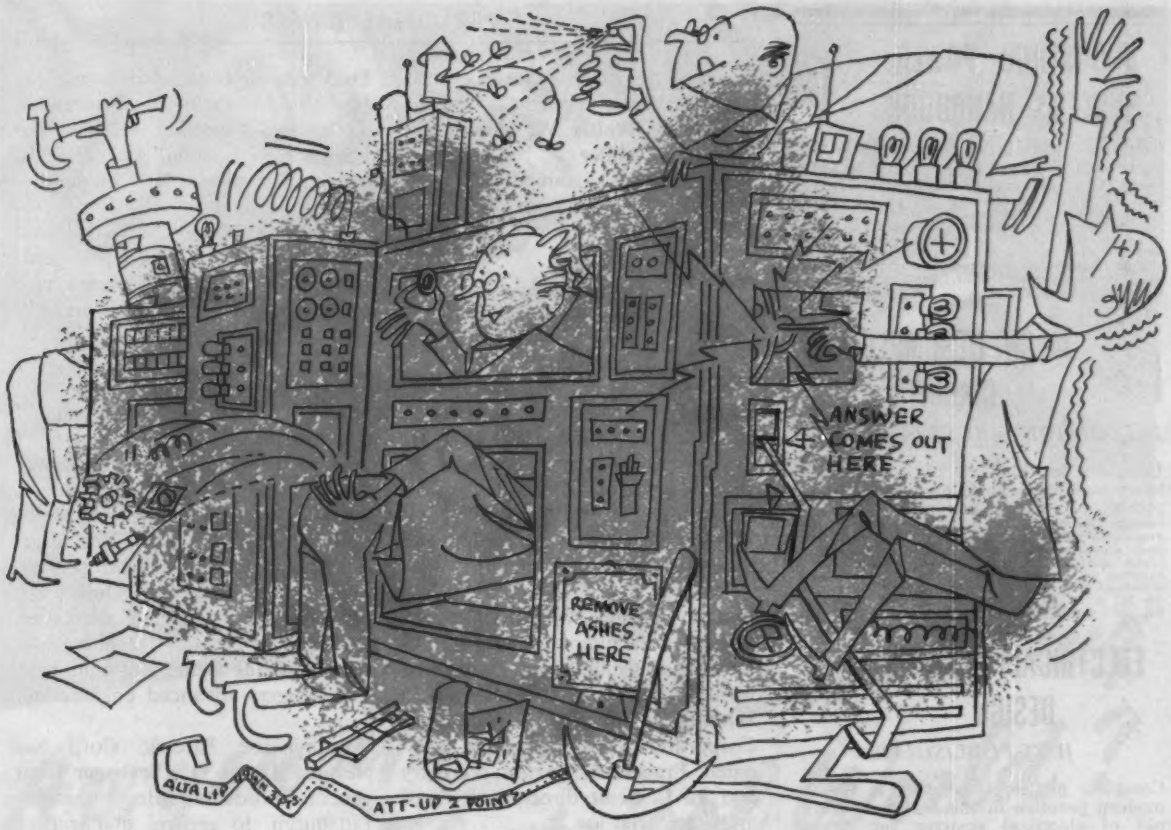
GUSTAFSON

Newly elected president of Infilco, Inc, is J. S. Gustafson, former executive vice president. He succeeds P. N. Engel, president for the past 55 years, who now becomes chairman of the board.

Gustafson, who has been executive vice president for the past four years, came to Infilco in 1951 as treasurer. The following year he was named vice president of the company. He was previously with Touche, Niven, Bailey & Smart as manager of the special services department, devoted to systems, procedures, and management consulting. He is a graduate of Northwestern University.

Engle, during his 55-year presidency, guided the firm's growth from household faucet filter manufacturer to designer and producer of high-rate liquid treating equipment.

(Personal Briefs on page 174)



Remember the Lightning-Vac?

While we're getting rid of a few bugs, stick with O-B Insulators.

Several power company customers seem to like the idea of a Lightning-Vac, a mythical device for telling at what time and location lightning is going to strike a distribution line.

"Let's order a half dozen."

"Why didn't you think of it before?"

"Are the ashes good for fertilizer?"

These have been a few typical comments and questions.

Naturally, in the face of such customer approval we've charged ahead with our design work. Unfortunately, there are quite a few bugs to be worked out.

In the meantime, we suggest you stick with O-B insulators on your distribution lines. They've been tested and found able to withstand man-made lightning with twice the rate of voltage rise of natural lightning.

It's our contention that the best protection against lightning is an insulator that won't puncture. So while the Lightning-Vac is being developed, stick with O-B insulators, conveniently available from your nearby Graybar house.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

Distributed by GraybaR ELECTRIC COMPANY

4740-H

INDUSTRIAL POWER SYSTEMS HANDBOOK

Combines descriptive and handbook features; shows every major phase in planning and designing industrial power systems. Covers wide range of subjects from short circuit protection, methods of voltage regulation, and allowable system voltage variations, to effect of design problems on flexibility and economy, and costs of power systems. Includes worked-out illustrative examples. Edited by Donald Beeman, Genl. Elec. Co. 971 pp., 6 x 9, 500 illus., $12.50

MAGNETIC-AMPLIFIER CIRCUITS

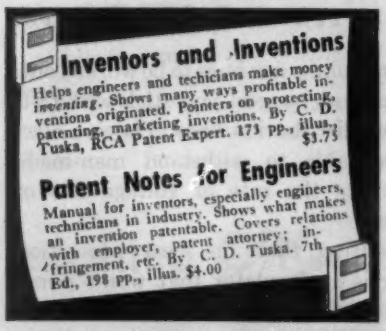
2nd EDITION — JUST PUBLISHED

Logically develops the various kinds of basic and more complex magnetic-amplifier circuit arrangements without extended use of mathematics. Descriptive and graphical methods are used to give qualitative and quantitative interpretation of essential facts. Material is systematically classified according to circuit functions so you can select solutions best suited to your special problems. By W. A. Geyger, U. S. Naval Ord. Lab. 2nd Ed., 277 pp., 6 x 9, 135 illus., $7.00

ELECTRICAL SYSTEMS DESIGN

JUST PUBLISHED

Complete picture of all that is best in modern practice in the design and layout of electrical systems for power, light, heat, signal systems, and communications. Shows how to select apparatus of the right type, size, appearance, or rating; how to work with the architect; how to design lighting systems scientifically, etc. By J. F. McPartland and Editors of Elect. Const. and Maint. 140 pp., 8½ x 11, illus. $6.00


Inventors and Inventions
Helps engineers and techicians make money inventing. Shows many ways profitable inventions originated. Pointers on protecting, patenting, marketing inventions. By C. D. Tuska, RCA Patent Expert. 173 pp., illus., $3.75
Patent Notes for Engineers
Manual for inventors, especially engineers, technicians in industry. Shows what makes an invention patentable. Covers relations with employer, patent attorney; infringement, etc. By C. D. Tuska. 7th Ed., 198 pp., illus. $4.00

SEND THIS FREE EXAMINATION COUPON

McGraw-Hill Co., Inc., Dept. W-5-20
327 W. 41st St., N. Y. C. 36

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with this coupon—same return privilege.)

- ☐ Boeman—Indus. Power Sys. Hdbk., $12.50
- ☐ Geyger—Magnetic-Ampl. Circ., $7.00
- ☐ McPartland—Elec. Sys. Design, $6.00
- ☐ Tuska—Inventors & Inventions, $3.75
- ☐ Tuska—Patent Notes for Engrs., $4.00

(PRINT)
Name .....
Address .....
City .....Zone....State.....
Company .....
Position .....
For price and terms outside U. S. Write McGraw-Hill Int'l., N. Y. C. W-5-20

PERSONAL BRIEFS

Recently named assistant vice presidents of Public Service Co of Colorado were **Walter W. Howell** and **Donald J. Miller** . . . **Edward A. Schroeder** has assumed the safety supervisor position at Wisconsin Public Service Corp.

Pacific Power & Light Co's **Homer Beale** has been named an assistant general manager.

New director of production for B. C. Power Commission is **T. B. Bird** . . . Los Angeles Dept of Water & Power has named **William A. Beaton** general superintendent of Operating & Maintenance Division's transmission, trouble, and street light section.

Ben T. Wiggins was recently appointed a member of Georgia Public Service Commission . . . Delaware PSC has named **Frederick P. Whitney** as attorney . . . Arizona's Corporation Commission has designated **Francis J. Byrnes** secretary and **L. L. Scott** director of Tariff and Rate Division.

Clarence H. LeVee is new director of engineering, research, and development for Hubbard & Co. In addition, **Arthur C. Westrom** will supervise research and development activities on electrical protective devices, **Jules Mack** on pole line hardware, and **Robert Hartman** on aluminum products.

Dr Vannevar Bush, chairman of the board of Massachusetts Institute of Technology, recently received the annual New England Award, Engineering Societies of New England.

Thor Power Tool Co has elected **James A. Lind** vice president-finance and **John F. Corkery** vice president-public relations. Lind will continue as treasurer as well.

General Electric Co's industrial heating department has named **Clarence M. Stevens** as manager of manufacturing . . . **Hugh R. Lowry** is new manager of application engineering for GE's semiconductor products department . . . Recent industry control department promotions include **Joseph S. Quill's** appointment as manager of marketing research and product planning and **Dr. F. Meade Bailey's** appointment as manager, advanced engineering.

Westinghouse Electric Corp has elevated **James O. Clevenger** from general products sales manager, Pittsburgh, to general manager of Bryant Electric Co, wholly owned subsidiary.

Harold A. Peterson, chairman of electrical engineering department, University of Wisconsin College of Engineering, has been awarded the annual Benjamin Smith Reynolds Award for excellence in teaching future engineers.

SALES ASSIGNMENTS

COMPANY STAFFS

Babcock & Wilcox Co's Tubular Products Division has appointed J. Y. McCandless manager at the Syracuse (N. Y.) district sales office.

General Electric Co's large lamp department has designated the following as managers of its five new regional sales offices: Everett G. Agee, Eastern region, New York, N. Y.; Douglas B. Clark, southern region, Atlanta, Ga.; Frederick F. Denny, Midwestern region, Chicago, Ill.; Joseph M. Lime, East Central region, Cleveland, Ohio; and Donald D. Scarff, Western region, San Francisco.

Graybar Electric Co, Inc, has appointed J. H. Bailor as manager of the Northwestern district at Eugene, Ore. H. O. Colburn, former Eugene manager, transfers to Spokane June 1 in the same capacity . . . J. L. Oglesby is new manager and W. H. Chrisp is new operating manager at Little Rock, Ark., for the Mississippi Valley district.

Joseph T. Ryerson & Son, Inc, has appointed John Cattanach, Jr, as manager of sales of tubular products and cold finished steel bars at the Buffalo plant . . . H. Daniel Robb has been advanced to national product manager, alloy steels, with headquarters at the Chicago plant. . . . At the Philadelphia steel service plant, Harry A. Zahn has been named manager of alloy steel sales.

Willys Motors, Inc, has named James J. Beattie, Jr, as manager of the Western Division with headquarters at San Francisco.

Are you MISSING something in Electrical World?

You don't **want** to miss **anything** in the new Electrical World, but, like a small boy at his first circus, **you have to know where to look.** That's where we come in, to play ringmaster. Right now, check the bigger, easier-reading, full-page Table of Contents—first right-hand page. Turn to the Editorial Page which each week will pull together industry thinking on subjects of importance, topping it with a helpful, independent, objective viewpoint. Next you'll hit the high spots of newsworthy industry happenings, covered thoroughly, rapidly, in compact, current-events style. Following this are the week's "lead" articles—full feature treatment of the top news and technical story. And completing the section is the weekly package of technical feature articles you know so well, authored by our 22 full-time editors or by an acknowledged industry authority. For your own information, look over this whole section right now, while you have a minute.

You'll find it's easy, it's smart to be informed on your industry the Electrical World way, through . . .

"The Electrical Industry's Weekly Magazine"

MEETINGS CALENDAR

MAY

Edison Electric Institute—Electrical System and Equipment Committee, Statler Hotel, Buffalo, N. Y., May 20-21.

American Institute of Electrical Engineers—Eighth Annual Appliance Technical Conference, Rockingham Bldg., Detroit, Mich., May 20-21.

• **Kansas Farm Electrifications Council**—2nd Farm Power Use Conference, Wichita, Kan., May 21.

American Public Power Association—Lake Placid Club, Lake Placid, N. Y., May 21-23.

Pennsylvania Electric Association—Systems Operation Committee, Skytop Lodge, Skytop, Pa., May 23-24.

National Association of Electrical Distributors—49th Annual Convention, Sheraton Park and Shoreham Hotels, Washington, D. C., May 26-29.

JUNE

Electric Companies Advertising Program—Management Group, Palmer House, Chicago, Ill., June 2.

Electric Companies Public Information Program—Steering Committee, Palmer House, Chicago, Ill., June 2.

Eighth Annual Conference on Industrial Research—Sponsored by the Department of Industrial and Management Engineering of Columbia University, Arden House, Harriman, N. Y., June 2-7.

American Management Association—General Management Conference, Statler Hotel, New York, N. Y., June 3-5.

American Society of Refrigerating Engineers—53rd Annual Meeting, Hotel Fontainbleau, Miami Beach, Fla., June 3-5.

Edison Electric Institute—Annual Convention, Palmer House, Chicago, Ill., June 3-5.

National District Heating Association—48th Annual Meeting, The Homestead, Hot Springs, Va., June 3-6.

Electric Association—Chicago Electrical Industry Show, Conrad Hilton Hotel, Chicago, Ill., June 4-6.

American Institute of Electrical Engineers—Industrial Power Rectifiers and Semiconductor-Metallic Rectifiers Committees, Morrison Hotel, Chicago, Ill., June 4-5; Summer General Meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, June 24-28.

American Society of Mechanical Engineers—Semiannual Meeting, Sheraton-Palace Hotel, San Francisco, California, June 9-13.

Public Utilities Association of the Virginias—Accident Prevention Conference, Daniel Boone Hotel, Charleston, W. Va., June 14; Sales and Publicity Committees, Charlottesvile, Va., June 20-21.

American Society for Testing Materials—Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-21.

Industrial Management Center — Fourth Annual Material Handling Training Conference, Lake Placid, New York, June 16-29.

Canadian Electric Association — Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 19-21.

American Society for Engineering Education—Annual Meeting, Cornell University, Ithaca, N. Y., June 17-21.

Wisconsin Utilities Association—Annual Convention, Accounting Section, Kings Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

Michigan Electric Association—Grand Hotel, Mackinac Island, Mich., June 23-26.

American Society of Heating and Air Conditioning Engineers—Semi-annual Meeting, Manoir Richelieu, Murray Bay, Quebec, June 24-26.

AUGUST

Western Electronic Show and Convention—Annual Meeting, Cow Palace, San Francisco, Calif., August 20-23.

American Institute of Electrical Engineers—Pacific General Meeting, Yakima, Washington, Aug. 26-30.

SEPTEMBER

• **American Institute of Electrical Engineers**—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pennsylvania, September 4-6; Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Instrument Society of America—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Edison Electric Institute—Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25, Meter & Service Committee, Hotel Nicolett, Minneapolis, Sept. 24-26; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

Public Utilities Association of the Virginias—39th Annual Meeting, White Sulphur Springs, W. Va., Sept. 20-21.

Lake Michigan Club—Annual Meeting, French Lick-Sheraton Hotel, French Lick, Ind., Sept. 21-24.

American Society of Mechanical Engineers—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

Electric Companies Public Information Program—Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

OCTOBER

• **Indiana Electric Association**—French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

• **International Association of Electrical Leagues**—Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

• **American Institute of Electrical Engineers**—Fall General Meeting, Morrison Hotel, Chicago, Illinois, October 7-11.

• **Edison Electric Institute**—Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 10-11; Transmission & Distribution Committee, Statler Hotel, Boston, Mass., Oct. 17-18.

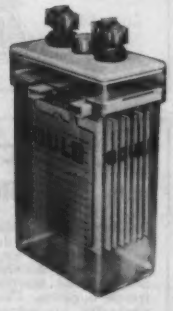
• **Interstate Power Club**—Hotel Martinique, New York City, N. Y., October 14.

• **National Association of Railroad Utilities Commissioners**—Annual Convention, Peabody Hotel, Memphis, Tennessee, October 28-31.

• Additions this week.

Pheasant hunting in Tacoma, Washington, where many champion field dogs are raised.

Set Your Sights on Longer Battery Life:



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

Here's a tip that may help you.

You can reduce battery costs, save your company money and be better able to judge the comparative value of each make of battery, if you simply keep good battery maintenance records. You will extend battery life by consulting these records frequently, thereby assuring the best possible operating procedures.

Why not talk this idea over with your local Gould representative . . . he will give you easy-to-use maintenance record charts. Gould-National Batteries, Inc., Trenton 7, N. J.

Always Use Gould-National Automobile & Truck Batteries

More Power to you from **gould BATTERIES**

©1957 Gould-National Batteries, Inc.

PROFESSIONAL SERVICES

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

ELECTRICAL TESTING LABORATORIES, INC.
Electrical, mechanical, photometric, radiometric and chemical laboratories, rendering testing, research and associated services, including certification. Inspections at factories and field investigations.
2 East End Avenue at 79th St., New York 21, N. Y.

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design
Engineers . . Purchasing
Specialists in Financing
Accounting and other Operations
231 So. La Salle St. Chicago 4

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Endfield St. Hartford, Conn.

HOOSIER ENGINEERING COMPANY
Erection and Maintenance of
Electrical Transmission and Distribution Lines
1384 Holly Avenue, Columbus, Ohio

SARGENT & LUNDY
Engineers
140 South Dearborn St.
Chicago, Ill.

COMMONWEALTH

SERVICES INC.	ASSOCIATES INC.
Management and Business Consultants	Consulting and Design Engineers
300 Park Ave. New York 22, N. Y.	209 E. Washington Jackson, Michigan

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Investigations—Depreciation Studies—Cost Trends—Reports
for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Original Cost and Continuing Property Record Determination
Ann Arbor, Michigan

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street Abilene, Texas

DAY & ZIMMERMANN, INC.
Engineers & Constructors
Transmission & Distribution Lines
Substations
Design & Construction
Reports - Valuations - Rates
Industrial & Utility
New York PHILADELPHIA Chicago

M. W. KELLOGG
Piping System Flexibility Analyses
Unique model tester as well as modern digital computer facilities available for low cost, accurate flexibility analyses of the most complex piping systems.
The M. W. Kellogg Company
711 Third Ave., New York 17, N. Y.

SEARCHLIGHT SECTION

BUSINESS: **"OPPORTUNITIES"** : EQUIPMENT : USED OR RESALE

FOR SALE
Subject to Prior Sale

1750 feet, G.E.
15 KV AERIAL CABLE

3/C #2 (19/.0591") coated copper, semi-con. tape, 19/64" Super Coronal tape, tapes 5/64" Geoprene, cabled and bound to a ½" EHS 30% copperweld messenger for 15 KV grounded neutral service. 6 only #T17631-3D, G&W 1 conductor 15 KV pothheads. If interested contact N. C. Stirewalt, V.P.,

Central Illinois Public Service Co.
Springfield, Illinois.

FOR SALE

One (1) Four Wheel Drive Line Construction and Maintenance Truck with 6 man crew compartment line body and pole raising equipment.
Model HRU—1946 Mileage: 57,700
Wheel Base—170"
Tires—Dual Rear 900 x 20
Engine No. 68482—Model 6M2A-34
Serial No. 112422
Weight including truck, body and basic equipment approximately 21,300 lbs.
Winch—2 drum 20,000 lbs.
Body—American Coach
Derrick—T Type—has set up to 60 ft. poles
PRICE $2,600.00
Cash on delivery driveway—Fairmont, West Virginia

MONONGAHELA POWER COMPANY
Purchasing Department, Fairmont, W. Va.

REPLIES (Box No.): Address to office nearest you
c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Electrical Designers—Top Salary, Scheduled Overtime at Time & One-Half Rates. Immediate Openings. Permanent Positions. Paid Holidays & Vacations. Experience required in Power Plants and Industrial Buildings. . . Marbarry Corp., 120 Greenwich St., N. Y. 6, N. Y. REctor 2-3749.

Assistant Vice President—For firm in Fairfield County, Connecticut. Must be thoroughly familiar with public utility field, including operations. To evaluate operating methods; handle preliminary development of construction and operating budgets; help analyze rates, supervise new rate studies, and act as witness in preparation of rate cases for public utility commissions; handle labor contracts and negotiations. Must be an electrical engineering graduate. Age: 35-45. Salary: to $15,000. P-5044, Electrical World.

Relay Engineers—for electric utility in Central New Jersey. Degree in electrical engineering required. Experienced in relay or related work. Age 30-45. Salary commensurate with experience. Considerable opportunity for advancement. P-5091, Electrical World.

DON'T FORGET
the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

SALES ENGINEERS
(4 REQUIRED)

Prefer graduate Electrical Engineer with at least five (5) years experience in Electrical distribution, or fuse cutouts and lightning arrester design or application.

Man desired must be of good character. Work involves sales engineering on cutouts and lightning arresters. Position will require traveling.

Compensation commensurate with experience and ability. Positions afford real opportunity for advancement. All communications held strictly confidential.

Send resume to C. H. LeVee
Hubbard & Co., 5401 W. Roosevelt Road
Chicago 50, Ill.

ELECTRICAL DESIGNERS

Conduit and physical layout men. Control and wiring exp. desirable but not necessary Work in air conditioned offices of a leading hydroelectric consultant in Chicago. Good starting salaries and liberal fringe benefits. Challenging work and opportunity for advancement. Please send complete resume to Hugo Niemi, Personnel Manager

HARZA ENGINEERING CO.
400 West Madison Street Chicago 6, Ill.

Advertising in This Issue

Allen-Bradley Co. 157, 158
Allis-Chalmers Mfg. Co. ..... 4th Cover
8, 9, 55, 56, 127, 148, 149
American Blower Div. American-Standard 42, 43
American Creosoting Corp. 45
Anaconda Wire & Cable Co. 69

Babcock & Wilcox Co. 30, 31
Blackburn Corp., Jasper 147
Blaw-Knox Co., Power Piping and Sprinkler Div. 70
Bristol Company 57
Brown Company 138

Commercial Filters Corp. 146
Copperweld Steel Co. 16
Crescent Tool Co. 61

Delta-Star Electric Division, H. K. Porter Company, Inc. 123
Directory of Engineers 178
Dow Corning Corp. 145

Ebasco Services, Inc. 139
Electrical Engineers Equipment Co. 10
Electrical World 175
Electro-Motive Div. General Motors 124, 125
Engineers, Directory of 178

Fargo Mfg. Co., Inc. 13
Ferranti, Ltd. 52
Fisher-Pierce Co., Inc. 29
Fluor Corp. 64
Foster Wheeler Corp. 6

G & W Electric Specialty Co. 155
General Cable Corp. 71
General Electric Co.,
Apparatus Dept. ..... 2nd Cover
46, 47, 109, 110, 111, 112
114, 115, 117, 119
Wire & Cable Dept. 58, 59
Gould-National Batteries, Inc. 177
Graver Tank & Mfg. Co., Inc. 12
Graybar Electric Co., Inc. 7

Hotpoint Co. 53
Husky Products, Inc. 140

I-T-E Circuit Breaker Co., Switchgear Div. 62, 63
Indiana Steel & Wire Co., Inc. 142
Ingersoll-Rand 28

Katolight Corp. 165
Kearney Corp., James R. 33
Klein & Sons, Mathias 122
Kuhlman Electric Co. ..... 3rd Cover

Line Material Industries 23, 24, 25, 26, 27
Long-Bell Div. International Paper Co. 151

Macallen Company 60
Malleable Iron Fittings Co. 72
McCabe-Powers Auto Body Co. 65
McGraw-Hill Book Co., Inc. 174
Moloney Electric Co. 73, 74, 75, 76
Motorola Communications & Electronics, Inc. 68
Multi-Amp Corp. 150
Murray Mfg. Co., D. J. 150

Ohio Brass Co. 173
Okonite Co., The 4
Orangeburg Mfg. Co., Inc. 164

Pacific Coast Engineering Co. 141
Palnut Company 154
Paranite Wire & Cable Div., Essex Wire Corp. 180
Pennsylvania Transformer Co. 11, 51
Permutit Company 38
Pfaff & Kendall 54
Pioneer Service & Engineering Co. 137
Pittsburgh Piping & Equipment Co. 50
Preformed Line Products Co. 152

R T & E Corp. 143
Reddy Kilowatt, Inc. 121
Reliable Electric Co. 35
Riley Stoker Corp. 14, 15
Rome Cable Corp. 169, 170, 171

S & C Electric Co. 18
Sangamo Electric Co. 36, 37
Sargent & Lundy Engineers 49
Searchlight Section 178
Shaw-Perkins Mfg. Co. 156
Southern States Equipment Corp. 17
Southwire Company 40
Stone & Webster Engineering Corp. 163

Thomas & Sons Co., R. 48
Tobe Deutschmann Corp. 44

United States Steel Corp., Coal Chemical Sales Div. 166, 167

Wagner Electric Corp. 32
Westinghouse Electric Corp. 41, 66
67, 129, 130, 131, 132, 133
134, 135, 136
Westinghouse Electric Corp. Lamp Div. 144, 145
Wheeler Mfg. Co., C. H. 34
Wright Hoist Div. American Chain & Cable 156

York-Hoover Corp. 39

■

PROFESSIONAL SERVICES 178

■

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 178

EQUIPMENT
(Used or Surplus New)
For Sale 178

You're on target... in Electrical World

if you want to reach anyone concerned with the large-scale generation, transmission, distribution or utilization of electricity . . . because that's the length, breadth and height of ELECTRICAL WORLD's audience of 26,000 *all-paid* subscribers . . . in the utilities and big industry, among electrical manufacturers and consultants. No other magazine covers the *entire* Electric Power Industry, no other magazine commands the loyal attention of the industry. For further fast, fact-full information, write for "Quick Facts" . . . Electrical World, 330 West 42nd St., New York 36, N. Y.

MEN RESPONSIBLE FOR POWER DISTRIBUTION KNOW...

IF IT'S PARANITE IT'S RIGHT!

From Aerial to Underground Wire and Cable

Over a period of 67 years Paranite has steadily built a reputation for quality wire products and dependable service. Overhead . . . or underground . . . there's a Paranite cable specifically engineered to perform in excess of your requirements. SUPER-PARARITE® butyl rubber insulations have been developed to withstand conditions in your area. Copper or aluminum bare or weatherproof cables . . . ACSR or line wire (formerly products of Midland Wire Corporation) are also available.

PARANITE WIRE AND CABLE

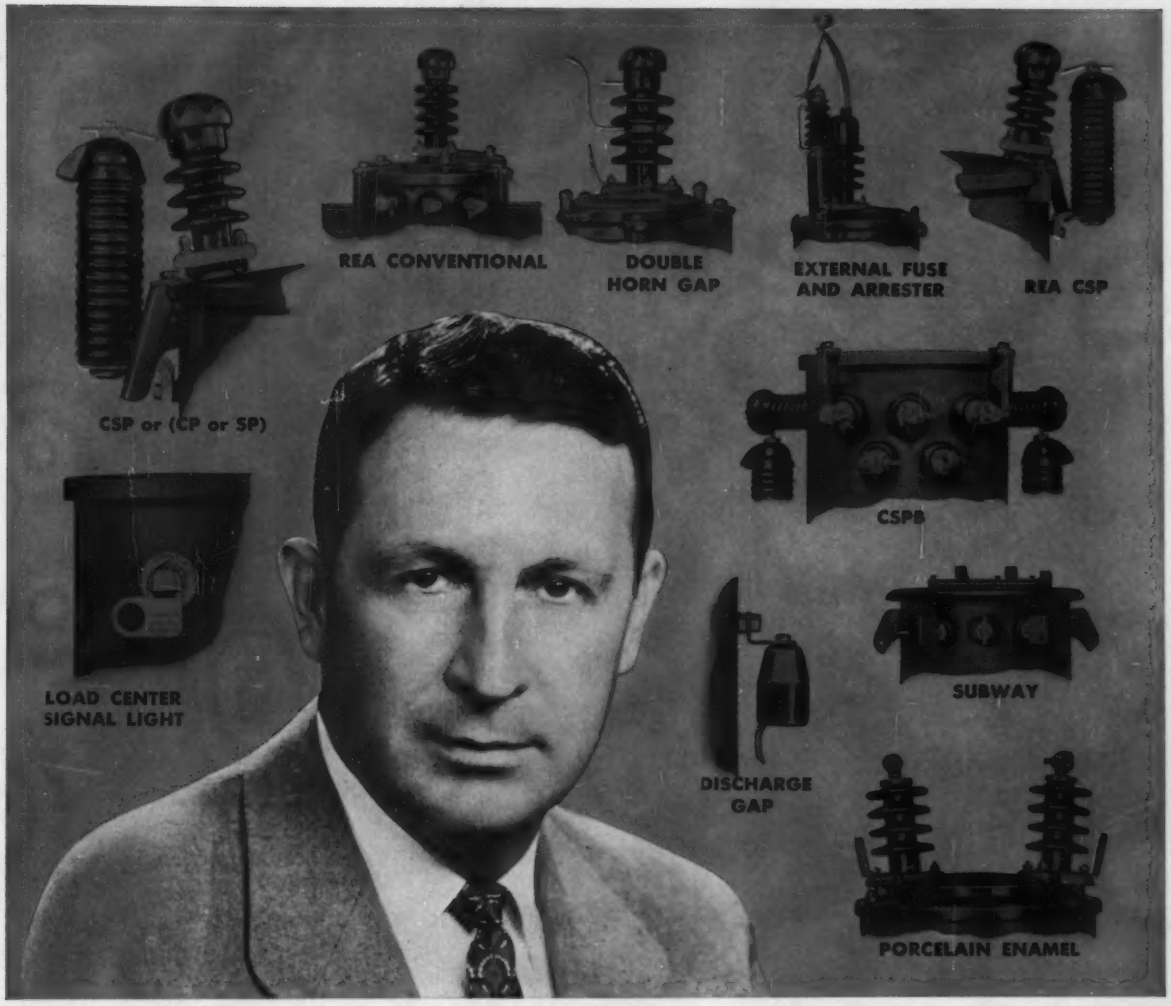
DIVISION ESSEX WIRE CORPORATION

FORT WAYNE 6, INDIANA

MANUFACTURING PLANTS: ***Birmingham, Ala.; Anaheim, Calif.: Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio**

Warehouses* and Sales Offices

Atlanta, Georgia
*Chicago, Illinois
Cleveland, Ohio
Dallas, Texas
*Detroit, Michigan
Hartford, Connecticut
Indianapolis, Indiana
*Kansas City, Missouri
*Los Angeles, California
*Newark, New Jersey
Omaha, Nebraska
*Portland, Oregon
Upper Darby (Philadelphia,) Pa.
Phoenix, Arizona
Rochester, New York
*Saint Louis, Missouri
*San Francisco, California
Springfield, Illinois



KUHLMAN "Salesman of the Week" If you can identify this Kuhlman representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Mich., you will receive a valuable gift.

"TAKE A LOOK AT THIS DISPLAY OF KUHLMAN DISTRIBUTION TRANSFORMERS . . .

. . . It will give you some idea of the many design variations Kuhlman offers. Conventional . . . CSP . . . REA . . . Subway . . . Banked (CSPB)—whatever your transformer needs are, Kuhlman has just the right unit for the job.

"Each design is light, compact and easy to interchange as your load grows. Most feature "Quick-Grip" insulated high voltage bushings for ratings above as well as below 5 KV. In the CSP line you have a choice of either expulsion or valve type arresters. And for special requirements you can order: over-load signal lights for conventional transformers . . . oversized bushings for increased creepage and high altitudes . . . discharge gaps for ungrounded tanks . . . porcelain finish for corrosive atmospheres . . . and many others.

"I've been able to illustrate only a few of the possibilities here. If what you need is not here, get in touch with your local Kuhlman representative. He'll give you the whole Kuhlman story."

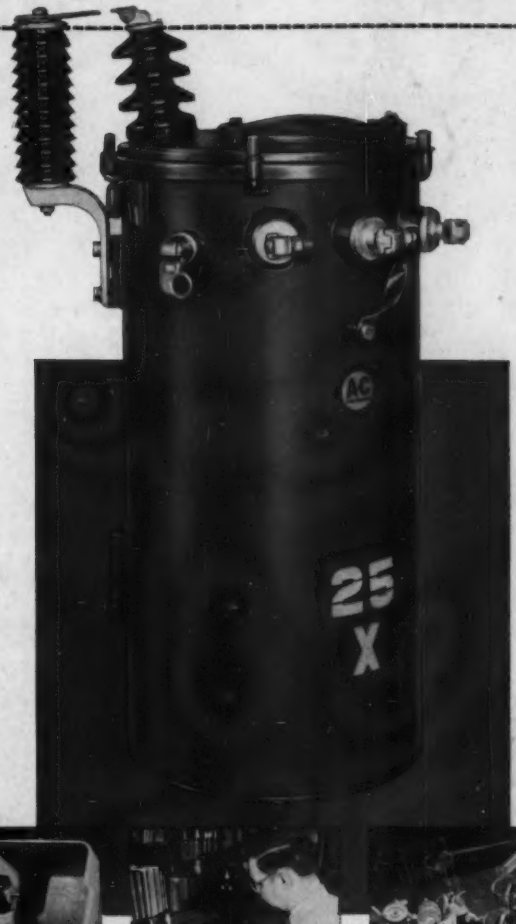
5712a

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

Quality Control at Allis-Chalmers

Rigid Acceptance Tests weed out "Weak Sister" Materials

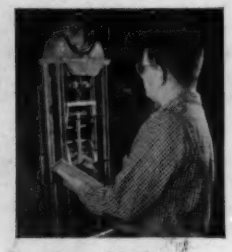


Customers confidently expect — and get — top performance out of Allis-Chalmers transformers. One of the chief reasons is that all materials are given a double inspection. Not only must they pass standards of the American Society for Testing Materials, but must also meet Allis-Chalmers rigid specifications.

Illustrated are a few of the acceptance tests made on materials.

Core Steel

Epstein samples are tested for watt loss per pound, volt-amperes per pound, lamination factor, insulation resistance and ductility. Close control results in reduced size and weight of transformer, low losses and good regulation.



Insulation

Samples of each type of insulation are tested to determine dielectric strength, flexibility, thickness, power factor, aging resistance and oil proofness. At least five different resistance tests are also performed upon the complete transformer.

Oil

In addition to the supplier's certified reports, covering about 20 properties, A-C tests call for a contamination inspection of each incoming tank car. Oil is also tested for specific gravity, viscosity, dielectric strength and insulation resistance.

Paint

Paints are tested for specific gravity, weight, viscosity, percent solids, color match, drying time, hardness. Durability tests include weathering and accelerated tests in salt spray and humidity chambers, in addition to outdoor exposure tests.

Connectors

In an Allis-Chalmers quality control test, a specified strain is placed on connector bolt. Connector is then placed in solution of mercurous nitrate. The strain and action of the acid cause defective connectors to split or break.

Get Bulletin 61B8355. Contact your A-C district office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

A-5210

ALLIS-CHALMERS